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Managing academic research initiatives: Case Aalto University's Energy Science Initiative

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This thesis examines the management of an academic research initiative in a context of increasing academic managerialism. This study examines Aalto University's Energy Science Initiative (ESCI), focusing on the phases of its development between 2011 and 2014. ESCI was a strategic research initiative that aimed to promote and build momentum around energy research in the School of Science. Two research questions were posed: How did the strategic research initiative ESCI develop during its lifecycle? And, how should universities organize and manage strategic research initiatives?

The research methodology followed the principles of grounded theory building. The research process was an iterative data-oriented process in which inductive analysis of qualitative data constituted the basis for generating findings, then combined with observations from the previous literature. The empirical material was based on 23 interviews, 3 observed events and large number of case related documents.

Addressing the first research question, the findings show that ESCI's development process was characterized by four phases, each influenced by a set of distinct factors: Emergence of the initiative, sudden budget cutback, adaptation to scare resources and shift from research to students. First, ESCI emerged from the abundance of funding and managerialistic search of strategic focus. The sudden budget cut in after the first year of operation was influenced by the overall financial situation, communication practices, challenging organizational position in comparison with the other school's initiatives, and ambiguity in initiating research projects. Adaption to decreased budget was facilitated by reducing and refocusing activates, and by reorienting the initiative towards students.

Answering the second research question, the findings provide basis for four suggestions for the management of academic initiatives: Focus on finding a common focus, commit to and create commitment, form effective communication practices, and foster local academic initiatives.

Keywords: academic initiative, higher education management, managerialism, interdisciplinary research	Publishing language: English

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Tässä diplomityössä tutkitaan akateemisen tutkimusinitiatiivin johtamista vallitsevan akateemisen managerialismin kontekstissa. Tämä tutkimus tarkastelee Aalto-ylipiston Energy Science Initiativea (ESCI) ja erityisesti tekijöitä, jotka vaikuttivat ESCI:n kehittymiseen vuosien 2011 ja 2014 välillä. Energy Science Initiative oli Aalto-yliopiston Insinööritieteiden korkeakoulun tutkimusinitiatiivi joka pyrki kokoamaan yhteen ja kehittämään Aalto-yliopiston perustieteiden korkeakoulun energiatutkimusta yhdeksi koulun strategiseksi painopistealueeksi. Tämä diplomityö pyrkii vastaamaan kahteen tutkimuskysymykseen: Kuinka strateginen tutkimusinitiatiivi ESCI kehittyi sen toimintakauden aikana? Sekä, kuinka yliopistojen tulisi järjestää ja johtaa tutkimusinitiatiiveja?.

Tutkimus perustuu aineistolähtöiseen ’grounded theory’ lähestymistapaan, joka rakentaa yleistettäviä havaintoja laadullisesta aineistosta käsin induktiivisesti sen sijaan, että se hyödyntäisi aikaisemman tutkimuksen käsitteitä ja tietoa havaintojen käsitteellistämisessä. Aineisto pohjautui 23:een haastatteluun, 3:een tarkasteltuun tapahtumaan sekä suureen määrään tapaukseen liittyviä kirjallisia dokumentteja.

Vastauksena ensimmäiseen tutkimuskysymykseen tulokset nostavat esiin neljä vaihetta, jotka kuvaavat ESCI:n kehittymistä: Initiatiivin syntyminen, yllättävä budjetinleikkaus, toiminnan sovittamien niukkoihin resursseihin, ja toiminnan uudelleen suuntaaminen. Kussakin vaiheessa eri tekijät vaikuttivat hankkeen uudelleensuuntautumiseen. ESCI käynnistyi tavoitteena kehittää koulun strategisia painopistealueita, ja sitä tuki runsas yliopistotason strateginen rahoitus. Rahoituksen leikkaamisen takana olivat ensimmäisen vuoden toiminnan epävarmuus, yleisen rahoitustilanteen heikkeneminen, kommunikaatioon liittyneet haasteet sekä heikompi organisaationaalien asema suhteessa muihin koulun initiatiiveihin. ESCI sopeutui pienentyneeseen budjettiin supistamalla ja uudelleen suuntaamalla tutkimuksellisia toimintoja, sekä suuntaamalla ohjelma uudelleen opiskelijoiden tukemiseen.

Vastauksena toiseen tutkimuskysymykseen, tämä tutkimus tarjoaa neljä ehdotusta akateemisten initiatiivien johtamiseen: Olisi suositeltavaa keskittyä löytämään fokus, sitoutumaan ja luomaan sitoutuneisuutta, luomaan toimivat kommunikaatiotavat, sekä edistämään paikallisten akateemisten initiatiivien toimintaa.

Asiasanat: akateeminen initiatiivi, korkeakoulujen johtaminen, managerialismi, tutkimusrajat ylittävä tutkimus	Julkaisukieli: englanti

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Otso Roine, Helsinki, 26th November 2015

Table of contents

1 Introduction

1.1 Motivation of the study

Scientific research advances economic growth by supporting technological innovation. It creates innovations directly through innovation seeking research projects, which are then realized into products and further on to revenues for example by new startup companies or by research projects' client companies. Furthermore, scientific research directs other researchers and product developers into right direction as well as it urge them forward even after failing in their efforts (Fleming & Sorenson, 2004).

During the last 20 years governments in Europe, as well as globally, are reacting to the rapidly changing, turbulent and internationally competitive business and academic environment by reforming their university education system (e.g. Santiago et al., 2006; Deem, Mok & Lucas, 2008; Meister-Scheytt & Scheytt, 2005). In the core of this reform is a belief that the traditional collegial model of management with excessively democratic and decentralized operation management is too slow reacting in the fast paced changes (Santiago et al., 2006). Thus, the universities have being urged to adopt management practices from private business organizations (Santiago & Carvalho, 2008; Smeenk et al., 2009). The new approach is called by many academics (eg. Trowler, 2010; Smeenk et al., 2009; Deem, 1998) *New Public Management,* or *managerialism,* as opposed to *collegialism* of the traditional management orientation.

It includes the universities becoming more independent from governmental guidance, on the one hand, but more accountable for meeting certain performance criteria and adopting internal control measures, on the other (Trowler, 2010; Deem 1998). One aspect of managerialism is the increasing centralization of power to universities' executive bodies, in essence to rectors and deans who have adopted corporate managerial practices (Santiago et al., 2006), which occurs for example in sifting the decision making power from departments to school (Trowler, 2010).

With the reforms towards managerialism, the universities have also been encouraged towards a market orientation and diversification of their funding as the share of public funding has gradually being decreased (Teixeira & Koryakina, 2013).

Traditionally governments have been, especially in European universities (Liefner, 2003), the main funding source for scientific research in universities (Jung & Lee, 2014). Finnish universities' funding model report from the Ministry of Education and Culture from 2012 states that the proportion of which Finnish universities are funded by the government funding program is around two thirds of the universities total budget, a large majority of the university expenses. This extensive use of government funds on scientific research has raised concerns about the efficiency of the use of taxpayer's money (Liefner, 2003). As substantial funds are spent on research, governments want to make sure they will be allocated in a most efficient way, particularly under the growing pressure to reduce public expenditure (Deem, 1998). The pressure to streamline the budgets has being especially strong under ongoing global depression, and hence the governments' support to universities is under the microscope as well.

The demand for more efficient use of funds has increasingly led to a competitive and performance based funding of research projects (Geuna and Martin, 2003; Liefner, 2003). These research projects are competing from the budgets allocated to larger institutions, such as university schools, departments, or research programs that are following the larger strategic outlines set by the universities or the state governments. To receive funding for a research project the researchers must proof, often based on previous results, that the project will eventually give desired results (Kaukonen, 1997). Through this kind of screening the project outcomes tend to be more often positive than those of projects without an intensive screening (Geuna and Martin, 2003). Thus in quantitative terms, the competitive funding tends to be more efficient than non-competitive funding (Meister-Scheytt & Scheytt, 2005).

Managerialism is also presented in some higher educational discourse as the only way to promote innovation and thus contribute to countries' development in the globalized competition game of scares resources (Santiago & Carvalho, 2004). Smeenk and colleagues (2009) suggest that managerialism has a direct effect on university staff's job performance by helping them focus on their primary activities. They also recognize the negative effect of control on staff commitment, but argue that it does not have a negative effect on the performance. Also Meister-Scheytt and Scheytt (Meister-Scheytt & Scheytt, 2005) recognize the need for overall

improvement of management practices in the traditionally hierarchic university structures.

While managerialism is increasingly adopted in European universities in the hope of increased efficiency (Santiago et al., 2006), its benefits have been at the same time widely questioned in the higher education literature. For example, Teixeira and Koryakina (2013) suggest that, when the university funding is diversified, academics have an unequal opportunity to answer to the pressure of seeking for alternative funding sources, which only further supports the concentration of these funds to few institutions. Some researchers suggest that in the university staff level the pressure, increased top-down control build dissatisfaction among the staff members and consequently decrease their motivation and commitment (Ryan & Neumann, 2013; Teelken, 2012; Middlehurst & Elton, 1992).

Despite managerialism is supported as a way to increase the efficiency academic work, concerns have risen about the drawbacks of the efficiency maximization in scientific research (e.g. Jung and Lee, 2014; Geuna and Martin, 2003; Middlehurst & Elton, 1992). Namely, the concerns have focused on its high costs compared to the long-term benefits, homogenization of research papers through isomorphic pressure (Wedlin, 2007; Geuna and Martin, 2003), the gap between university research and education, and the autonomy of the research (Geuna and Martin, 2003), but especially its short-term advantages on the price of long-term wellbeing (Middlehurst & Elton, 1992). Middlehurst and Elton (1992) draw a bleak picture of the future of higher education institutions under managerialism, where its drive for larger units, pressure for competition and performance based funding model is proposed to lead deterioration of open communication between the management and the staff, and eventually to loss of morale and trust in institutions. Meister-Scheytt and Scheytt (2005) argue that the logic of efficiency and economically motivated means are oversimplified for directing the complex systems of universities; including societal relevance of research and individual and academic freedom.

Managerialism is suggested to have other effects on the operation of the university originations as well. Santiago et al (2006) note that academic managers, namely the deans, showed reluctance to manage according to the managerial efficiency and effect principles, for example laying off staff in the face of budget cuts. While the

managerialistic approach had increased the deans' managerial responsibility, they continued to identify themselves as academics. All of these mangers have also an individual way to interpret the call for efficiency and effeteness. Thus, as Blaschke, Frost and Hattke (2014) suggest, the change resistance of the old structures will slow down the change from collegialism to managerialism, and that the managerialism is more likely to be adopted to the structures than adopting the structures to it.

Alongside managerialism is also a movement towards encouraging interdisciplinary academic collaboration in order to grapple against the fragmentation of knowledge associated with knowledge specialization that the rapid knowledge increase have brought along with (Ryan & Neumann, 2013). The previous authors defined interdisciplinarity as an interaction of two or more disciplines that produces an outcome that could have not being achieved by one discipline alone. They further distinguish from it a less interacting multidisciplinary collaboration, which does not in by its definition require interaction across the discipline borders to achieve its outcomes. Nevertheless, projects with highly interdisciplinary teams have proven to, although being increasingly risky, create outstanding innovations compared to teams with low discipline variation (Fleming, 2004). Fleming further points out that although interdisciplinary projects creates more impactful innovations, on average the economic value of the mediocre results generated in projects with low disciplinary variance is greater compared to the projects with high disciplinary variance.

However, Ryan and Neumann (2013) describe how these risky but potentially more impactful interdisciplinary projects are facing difficulties with managerialistic pressure to create results in universities. Especially in times with decreasing governmental support the need for fast paced results is dissolving interdisciplinarity in higher education institutions. Strong top down decision-making and centralization of activates into larger clusters decreases the academic staff‘s sense of ownership and commitment, which is essential to the success of interdisciplinary teams. If the interdisciplinarity is nevertheless to be advanced in research projects, the academics in the project have to find a common focus, a well established internal and external communication channels and feeling of ownership among the academics, features which all are easier to promote in smaller groups (Ryan & Neumann, 2013). Kotter

(2001) argues that when resources are scarce, management is less eager to tolerate the ambiguity, which interdisciplinarity also brings along, and more emphasis is placed on controlling and monitoring. On the other hand, with the times of prosperity the management is enabling and tolerant, leadership is cherished over management and workgroups have a freedom to take distinctive, more risky paths.

These problems related to managerialism are not left unnoticed and therefore other management and funding models still very much exist, including support for the risky but potentially more impactful projects (Geuna and Martin, 2003). But, how do these projects that possibly create added value only after a longer period of time survive in an efficiency seeking academic environment? How does the pressure form this managerialistic environment affect activities in the research programs? Why do some research programs receive university management's support to implement their vision and some need to adjust their operations according to the support or fade away? In this study, these overall questions are examined by studying a research initiative, Energy Science Initiative (ESCI), within the newly formed Aalto University (Aalto) in Finland. ESCI was a strategic energy research and education initiative in Aalto University's School of Science (SCI). It began with a vision to become a world-class research platform, but as a result of series events was forced to narrow down its research activities and focusing on students through education and a student driven innovation space, Energy Garage. The study focuses on the development path of ESCI in order to better understand how different factors stemming from an increasingly managerialistic university setting affect the operation of academic research projects in a competitive university environment.

1.2 Research questions and scope

As earlier discussed, the study aims to determine the steps and the influence factors in the development of the study subject, ESCI, which had as its goal the creation of high impact research through multidisciplinary research projects in an institutional environment that has traditionally supported a more structured and strategy oriented management of research. In other words, the study seeks an answer to a question: Why the development of this strategic initiative happened as it happened? In addition, the study attempts to increase understanding of how these research initiatives as ESCI are affected by the structures of organization, communication and

research operation practices in managerialistic university environment. Therefore, the main research question of the study is

How did the strategic research initiative ESCI develop during its lifecycle?

In order to answer this research question, the study will examine ESCI's development path from the perspectives of three organizational levels of Aalto university, starting from the Aalto management level but then mainly focusing on the School of Science management and the ESCI initiative and its members. School of Science is one of the six schools of Aalto University. The description and analysis ESCI's development path will reflect events, key actors and their perceptions on the events. In addition to examining the organizational perspectives of ESCI's development path, this study distinguishes external and internal factors such as Aalto funding policy or ESCI's management approach that influenced the operation, structure and development of ESCI.

This study also provides university managers insights about good practices of strategic initiative management in the future. This occurs by contributing to the academic literature of higher education studies by addressing a subsidiary research question

How should universities organize and manage strategic research initiatives?

1.3 Research process

To meet these goals the study aims to gain understanding of the development process of ESCI during its operation time. As the aim of the study aim concerned a particular single subject, a case-study method was seen as the most suitable choice of the empirical research method. Case study is also an effective method when addressing a research questions such as *how* and *why* (Yin, 2009). These questions seemed to fit well with the ESCI case, which represented a phenomenon with potential for interesting findings from the academic management study area.

With the study's data-driven approach to examine a case with potential for novel findings and further for theory building based them, a grounded theory approach, as introduced by Glaser and Strauss (1967), was chosen as the basis of this study and the theory building. For its data collection and analysis, the study implements a

grounded theory based methodology, so called Gioia –method that was introduced by Gioia, Corley and Hamilton (2013). The iterative nature of the empirical data analysis that this method and grounded theory methodology in general emphasizes was seen suitable for the abstract and loosely defined objectives of this study. In accordance with the grounded theory principles, this study purposefully sought to avoid pre-existing theoretical lenses in favor of developing findings inductively (Glaser & Strauss, 1967). Also the natural tendency to intuitively jump to conclusion based on the existing knowledge (Kahneman, 2012; Gioia, Corley & Hamilton, 2013) was acknowledged by the researcher and thus a strong emphasis was given to the analysis of empirical data without presumptions.

The research process followed the guidelines of grounded theory building, which will be further discussed in the Research methods –section. The research process began with the definition of the initial research questions, by examining the basic literature of higher education study field and getting familiar with the background information about the study case. This was immediately followed by a first set of interviews with identified key informants as well as initial data analysis of the other research material such as email discussions and meeting notes gathered before the actual research. As also suggested in the grounded theory literature (Strauss & Corbin, 1990; Glaser & Strauss, 1967), the interviews and other data were analyzed in an iterative manner, going through the data and transcribes and discussing about them among the research group members several times. The iterative analysis eventually led the research to a new direction, away from the initial interest to the question about Energy Garage emergence towards larger managerial context of the study case, to which the rest of the interviews then focused on.

After the data gathering phase the data was more precisely analyzed by coding the data in accordance with the grounded theory coding practices moving from ambiguous *open-ended coding*, to comparative *axial coding* and eventually categorizing *selective coding*, which together formed the *data structure* and the core for creating theoretical framework. Alongside with the data analysis the actual writing phase of the study progressed, which essentially supported the analysis process, but also revealed a need for second round of literature review and even further crystalized the research questions. Iteration of the empirical data analysis and

the theory building lasted until the last steps of the writing phase and the final conclusions were identified and formed only as the last step of the whole study process.

1.4 Overview of results

In an attempt to answer the first research question, the study proposed a following course of events:

ESCI arose out of a strategy of the university to emphasize energy research in the university operations and was authorized to operate across university department disciplines without a competitive funding policy. As will be described in more detail in the following sections, it was find out that although the school itself initiated ESCI, it did not receive the kind of support from the school as its ambitious objective as a high-class research program would have required. It rather faced cut-downs to its budget already early on in its operation. ESCI's performance was being evaluated largely by its short-term performance, as were the more traditional research programs in the Aalto University, and when it failed to meet the criteria that were set to it, the support was being cut down.

Despite the budget cuts, ESCI adapted to the impaired financial situation, which eventually reviled distinctively different two types of research approaches. One group of researchers continued to conduct research with a wide research scope and aiming rather to find potentially influential out-of-ordinary research topics than immediately seeking high academic impact. The other group was seeking to conduct research with high academic impact from the beginning on, and adapted to the lower budget by further narrowing down its focus.

Eventually, SCI's management, in the face of increased scarcity of funding resources, decided to end ESCI's research activates and instead fund a student driven innovation space, Energy Garage. After ESCI's three years of operation in 2014, when its research projects were brought to an end, Energy Garage was officially opened. The orientation shift from research to students and education with the student driven innovation space also changed SCI's support and commitment to ESCI's activates. It shifted from annual evaluation of ESCI's progress to the dean's promise for five years of funding for the Energy Garage. In short, trough it

development ESCI received the school's support, which it was missing during its first three years of operation as research program.

Based on the findings from the empirical research, the study identified four main steps in ESCI's development path: The emergence of the initiative, sudden budget cutback, adaptation to scarce resources and refocus of the operation. Within these steps, the study identified several internal and external influence factors that shaped and defined ESCI's development path. Firstly, ESCI emerged from the abundance of funding that allowed ESCI to freely define its operation approach without the demands of competitive funding sources. Also, it was partly Aalto's managerialistic urge to focus their operations. The second major step was ESCI's sudden budget cut, which resulted from four reasons: generally impaired financial situation, ESCI's ambiguous progress in its first year, ESCI's difficult organizational position among the other initiatives, and prevailed poor communication practices. The third step was adaptation to the impaired funding situation. It reviled two distinctive research approaches in ESCI: a specification to narrow focus area further condensed by the decreased budget, and explanatory research approach with shallower academic impact. On the other hand, from the school's managerial level, ESCI was being adopted to the financial situation by shifting its orientation away form potentially overlapping with Aalto's own energy research program towards students and education. The final step in ESCI's development path was its refocus to run student driven innovation space, Energy Garage. It was mainly affected by the active role of some ESCI individuals as well as a trend towards bottom-up innovation units, factories that gave confidence to the dean to support Energy Garage's operation.

Form these findings the study sought for an answer for the second research question and drew four managerial suggestions for the guidance of a dean wishing to establish strategic initiatives or for the management of these initiatives. The suggestions are: Focus on finding operational focus to increase sense of ownership and to from and easily communicable goal and strategy; Upper management should commit to support the initiative on long-term and thus increase the commitment of the initiative members; Form efficient communication practices that prevail apart from personal relationships; Foster local initiatives to enable a bottom-up operation approach to prosper.

1.5 Structure of the study

The study consists of four main parts This Introduction section described the motivation for the study through a review to the literature of the field of research of this study, it stated the research objectives and research question, descried the research process and gave a brief overview of the study subject as well as the initial findings. The introduction is followed by a description of the methods and data used in this study in a section, Material and Methods. After which, the focus moves to the empirical part of the study describing a rich narrative of the studied case study subject process in Empirical part section. Main findings from the empirical data are disclosed in Discussion section along side with the study's contribution to the academic literature and managerial suggestions that are built on the basis of the empirical findings and conclusions. The second research question will be will discussed in section in a 'lessons-learned' -manner by reflecting the empirical findings against the literature review of this study. In that section also the validity and reliability of the study is discussed and the outcome of the study is critically examined. In the Appendix, a visualized timeline of the case events is presented as well as a more detail table about the interviewed informants.

2 Research methods

As the first research objective was to examine the development of a research initiative in a dynamic university environment in the particular case of ESCI, single-case holistic study was chosen as the research method. In order to understand the deep-rooted causes of the turns in ESCI's development path, the research was extended to cover a wide range of actors around the study subject. Actors across the whole development path, including researching professors, students, deans, executive assistants and facility managers, were interviewed in semi-structured interviews. They best served the purpose of collecting rich narrative descriptions of events and actors taking part in ESCI's operation. In addition to the interviews email discussion, presentation slides, financial reports and other additional material were used as second, but not secondary, source of empirical data.

As the research continued and insight to the subject grew wider, the narrative nature of the interviews supported the grounded theory building conducted in accordance with the grounded theory methodology principles set by researchers Barney Glaser and Anselm Straus in their book "The Discovery or Grounded Theory: Strategies for Qualitative Research" (Glaser & Strauss, 1967). To further ensure the academic rigor of the study, Gioia method was selected as the analysis methodology of this study. It provides an enchanted means to present the inductive research process as well as structure data analysis part of the theory building (Gioia, Corley & Hamilton, 2013). Following the grounded theory, also in this study the theory building was systematically started from the first conducted interview and was iterated after each new interview or collection of other data (Strauss & Corbin, 1990).

This section will introduce the context of the study as well as further describe the methods used in the data collection, the data sources and analysis of the empirical data. The empirical research conducted as a single-case holistic study between the actors taking apart in or affecting Aalto University's Energy Science Initiative operation during 2011 to 2014.

2.1 Research context

This study examines a development process and the factors that influenced the development of Aalto University School of Science's (SCI) research program Energy Science Initiative (ESCI). During the examined process, ESCI developed from a multidisciplinary energy research initiative to varying outcomes of research collaborations, energy education and student driven innovation space in the dynamic organizational context of SCI and Aalto University.

As one of SCI's strategic initiatives, ESCI was a part of SCI's strategic agenda to identify and reinforce its key focus areas. In search of excellence in research, education and teaching, and societal impact, SCI established and funded a number of strategic initiatives without imposing competitive application for funding as typical of external funding sources. Due to the nature of the funding, ESCI, along with other SCI strategic initiatives, had a freedom for conducting activities that the traditional funding sources would not support. On the other hand, the funding of the initiatives was not guaranteed, but the school management board allocated funding based on annual evaluation. Furthermore, the initiatives were selected to be part of the school activities only for a few years at a time before they were planned to be integrated the university's other operations or funded from other budget sources. The operational freedom combined with the dependency of higher organizational level's annual decisions created a dynamic, managerialistic environment, where the initiatives were compelled to adjust them selves to the changes in the environment.

ESCI's development process was chosen as a case study subject on account of its adaptation to the changing funding conditions and support coming from the school and university management. On the other hand, ESCI's case seemed compelling study case also because of its multidisciplinary approach of conducting research that appeared contradictory to the short-term efficiency seeking managerialistic trend in European universities, as for example Ryan and Neumann (2013) have noted. The topic of multidisciplinarity is nevertheless not in the core of this study and for example it does not distinguish interdisciplinarity and multidisciplinarity from each other, as the mentioned researchers do. All the more, the actual development process

of the study subject ESCI will be thoroughly examined by relying on the rich empirical data to which the theory of this study will be build upon.

2.2 Research approach

This study focused on ESCI as single-case study. According to Yin (2009), a single-case study is well suitable for research questions 'why' and 'how' as well as when studying complex contemporary phenomena within their real-life context especially when the boundaries between phenomena and context are not clear. As Stake also noted (2005), the setting was laid on the basis of the specific case of ESCI that represents the interesting phenomenon this study aims to address, and thus the case itself was vehicle for the research, rather than just a suitable context for a certain type of research. Fundamentally, this research began from the identification of ESCI case as an interesting organizational and management phenomenon in higher education study context, rather than selecting ESCI as a case for studying a certain theory.

Then again, the term 'case study' is in it self too ambiguous and by definition merely an umbrella methodology, rather than a specific method (Stake, 2005), and thus more specific guidelines for the research approach were needed. For the purpose of this study, a grounded theory based method of theory building was perceived as the most suitable research approach. Corbin and Strauss (1990) define grounded theory to be a research approach, which aims to build a *theoretical explanation* by specifying phenomena in terms of conditions that give rise to them, how they are expressed through action/interaction, the consequences that result from them, and variations of these qualifiers."

Corbin and Strauss (1990) present Grounded theory has four main principles: *Theoretical sampling*, *constant comparison*, *concepts are the basic unit of analysis*, *'Categories' must be developed and related*. Basically, the principles propose that all informants or other studied instances should be representatives of concepts, not individual persons. The data collection and analysis are interrelative, meaning that these processes are not only conducted at the same time but already the initial analysis guides the next rounds of data collection. All incidents in the analyzed data are considered as potential indicators of phenomena of the theoretical interest, and are further labeled as concepts that describe or explain the phenomena. The concepts

are grouped into *categories* that them selves represent abstracted, 'higher level' concepts of the examined phenomena.

In practice, as well as in the context of this study, the grounded theory building is constant, iterative comparison among the identified incidents and developed concept and furthermore interactions and relations of the incidents that aims to find patterns and variation between them. Even when the analysis leads to the first propositions of the developing theory, the iterative analysis does not end but continues until 'theoretical saturation' is reached, meaning that no additional data would make significant changes to concepts and their relationships. In grounded theory, the writing process is seen as part of the theory building and thus the analysis and writing goes side by side. Ground theorist do not conduct the research alone, but discuss the their reasoning with researcher colleagues and together develop the theory. Finally the theorizing must be reflected to the subject context and framed to theoretical conditions where the observations may hold (Corbin & Strauss, 1990).

2.3 Data collection

Like grounded theory literature suggests (Corbin & Strauss, 1990; Glaser & Strauss, 1967) the approach of the data collection was to have a wide scope in gathering data from variety of sources, since the researcher do not know what data is important during the collection process. Only after iterative analysis rounds some parts of data rise to the surface and appear more significant for the study than others.

The data was collected from three main sources: interviews, documents and observation of events. First, altogether 23 interviews were conducted with key actors participating in or influencing the operation of ESCI. These interviewees represented 5 different categories of actors: SCI deans, ESCI professors, SCI administrators and managers, Energy Garage participants, and other key actors. From these interviews most of them were professors of ESCI and people participated in building and developing Energy Garage. Rests of the interviews were conducted among the deans of SCI, SCI administrative managers and assistants and two interviews with actors influencing but not directly affecting the operation of ESCI or Energy Garage. In addition to the interviews, empirical data was also collected by observing three events related to ESCI, from which two were recorded and transcribed. The third

data source included myriad of documents such as saved email conversations and ESCI meeting minutes. It was collected mainly prior to the actual research began, but also extended during the research process. This documented data, especially the email discussions were as well considered as a part of the ESCI story. From the supportive material more precise information could be collected with exact dates and name lists. The interviews, observed events and documented data are listed in Tables 1, 2 and 3 and further discussed next.

Interviews

SCI Deans

Name	Position	Interview duration (min)	Interview date
Risto Nieminen	Dean of SCI 2013 – on-going	75	20.03.2015
Kimmo Kaski	Dean of SCI 2012 – 2013	75	20.03.2015
Ilkka Niemelä	Dean of SCI 2011 – 2012	55	01.04.2015

ESCI Professors

Name	Position	Interview duration (min)	Interview date
Peter Lund	Director of ESCI 2011 – on-going	124	14.11.2014
Karlos Artto	Professor of Project-Oriented Business	106	21.11.2014
Antti Ylä-Jääski	Professor of Data Communications	76	23.02.2015
Tapio Ala-Nissilä	Professor of Physics	73	23.02.2015
Filip Tuomisto	Professor of Nuclear Engineering	73	11.02.2015
Lily Diaz-Kommonen	Professor of Systems of Representation	60	04.02.2015

SCI Management and assistants

Name	Position	Interview duration (min)	Interview date

Ilse Muroke	Development Manager 2010 – 2013	89	23.02.2015
Inkeri Ruuska	Development Manager 2013 – 2015	89	26.11.2015
Pirjo Peippo-Lavikka	Dean‘s Exec. Assistant (2011 – 2013)	120	20.05.2015
Kendrig Bingham	Technology Manager	60	01.12.2014
Ilkka Leppänen	Finance Controller	10	01.06.2015

Only Energy Garage related

Name	Position	Interview duration (min)	Interview date
Mikko Virta	Energy Garage Project Manager	85	14.11.2014
Markus Junkkari	Student Guild Chairman 2014	50	18.12.2014
Eetu Ahonen	Student Guild Chairman 2014	55	27.02.2015
Teemu Havisalo	Student Project Member	57	06.06.2015
Tuomas Autero	Student Project Member	98	10.02.2015
Valeria Gryada	Interior Designer	70	03.12.2014
Tarmo Havunta	Campus Designer/Manager	83	10.12.2014

Others

Name	Position	Interview duration (min)	Interview date
Petri Kuosmanen	Head of Machine Eng. Department	89	04.02.2015
Esa-Mikko Santamäki	Chief of Spatial Design in Design Factory	83	23.02.2015

Table 1 Interview informants, their categories, organizational positions and interview durations and dates

Events

Event	Number of Participants	Participants	Event date

Energy Garage Opening Event	~ 50 Participants	ESCI Members, Energy Garage Development Team, other related participants	02.10.2014
ESCI Wrap-up Seminar	~ 30 Participants 13 Informants	ESCI Professors, researchers, other related participants	17.12.2014
Yrjö & Senja Koivunen foundation discussion panel	25 Informants	Foundation members, professors, researchers, Energy Garage and Aaltoes representatives	06.02.2015

Table 2 Obeserved events with number of participants and participant types and event dates

Email discussion		**Documents**		**Pictures**	
Topic	**Amount**	**Type**	**Amount**	**Type**	**Amount**
ESCI board discussions	80	ESCI board memos, presentation slides and other related documents	270		
Energy Garage development and board discussions	5	Energy Garage development and building	124	Energy Garage building	101
Other initiatives	1	MIND course's Energy Garage project	50	MIND course's Energy Garage project	36
In total	**86**	**In total**	**444**	**In total**	**137**

Table 3 Amounts and types of documented data divided between email discussions, documents and pictures

Interviews

All interviews were conducted in a semi-structured format, introducing the interviewee to the subject and then letting them tell about the events around ESCI as they saw it happen. The interview setting resembled a discussion in which the interviewee was allowed to direct the interview to topics that he or she found most important. The form of the interview aimed for detailed description of events, actors and interactions (Atkinson, 1998), which analysis formed the development story (Polkinghorne, 1995).

All the interviews started off with an introduction question about the interviewees background, which was coupled up with a question of how their relationship to ESCI began and how it continued from there onwards. The interviewees typically continued to a story for example about how, when and with whom they acted in or around ESCI or Energy Garage. This story telling was not interrupted but encouraged to let the interviewee tell the whole story as he/she remembered it (Atkinson, 1998). Only after the first question about the story the interviews were guided with follow-up questions. The follow-up questions were asked "on the go" using the researchers own perception about which direction to guide the interviewee, catching on to interesting subjects or encouraging the interviewees to tell more details about the topic. While the predefined questions were interviewee specific and depending on person addressed issues such as:

- *The funding of ESCI and other initiatives in SCI*
- *Dean's role in managing initiatives*
- *Multidisciplinarity of the conducted research in ESCI*
- *Difference of ESCI compared to other initiatives*
- *Energy Garage space in relation to other innovation spaces in Aalto*
- *Interest towards Energy Garage among ESCI members*

In addition to the interviewee specific questions every interviewee was asked two questions: The first question asking whether or not there was anything the interviewee still wished to tell anything more, which typically was nothing, and the other one a question which answers were collected and further analyzed:

- *What was the single most positive event/instance/matter/person or anything else that occurred during your acting with ESCI?*

In accordance with the grounded theory literature's suggestion (Corbin & Strauss, 1990) the main aim of the interviews was to collect a rich story of ESCI's development told from different perspectives of the actors, looking it from different levels of university organization and from different times spans of ESCI's operation. Interviewing the deans helped to clarify the management level affection to the story, their role in the course of events as well ass gave understanding of how ESCI appeared to them in relation other initiatives, to school specific and to Aalto wide. Consequently, the interviews with SCI administrative mangers and assistant further

expanded the SCI management level's view on the events along ESCI's development path.

Whereas the SCI management's interviews uncovered managerial aspects of the ESCI case, the interviews with the researching professors and the board members of ESCI gave an deeper insight to the perceptions of ESCI's story from inside the strategic initiative. The interviews clarified the course of events in the story, different actors contribution to them along with their personal motivation for their participation and opinion on the results of ESCI's operation.

The interviews with the actors participating in the development, building and operation of Energy Garage on the other hand were part of the study's initial focus the phenomenon around Energy Garage emergence. These interviews mainly included actors such as students creating the concept for Energy Garage, Energy Garage's interior architect, project manager of the space and a facility manger from the campus services. Also the two other interviewees were both playing a role in the Energy Garage process. The roles and positions of all of the interviewees are presented in a Table 8 in the Appendix.

Observed events

The observed events were Energy Garage's opening event, ESCI's wrap-up seminar and a discussion panel held after Yrjö & Senja Koivunen foundation's scholarship ceremony. From these the two latter were also recorded and transcribed for more precise analysis.

The first event, Energy Garage's opening event, was not actually observed by the author himself but by his research colleagues. Nevertheless the information from this event was shared in discussion within the research team, which helped for example helped to identify the first interviewees of this study. The event was also referred in the interviews of the actors which participated in that event. The purpose of the event was to open the doors of Energy Garage to the public and recognizing the people who were building and developing it. Students and other members of the development and building team of Energy were present as well as many of the ESCI professors, SCI's administrators and Aalto management including the president.

ESCI's wrap-up seminar held in December 2014 was observed and recorded. In the seminar SCI's dean and the head of ESCI board described the development story of ESCI, and the leading professors of the four ESCI research areas presented the results of each research area and disclosed their opinion on ESCI outcomes. After the presentations ESCI professors joined in an open panel discussion on topics of ESCI's journey and research initiatives in general in Aalto. The discussion and the presentations proved to be valuable source of precise information about participant lists of the research projects, project results, budgets and personal viewpoints of how ESCI was and how it maybe should have being managed. Many of the information, even the precise 'hard facts' of the projects, was difficult to obtain through other sources, thus the observations from this event were greatly used in the data analysis of the study.

The third observed event was the discussion panel in the Yrjö & Senja Koivunen foundation's scholarship ceremony. The in the panel the foundation's representatives, professors from ESCI as well as other professors from Aalto, and students from Energy Garage and Aalto Entrepreneurship Society discussed topics of Energy Garage space, its users, and student driven actives in Aalto and in general. Also the author with his colleagues participated in the discussion them selves to the discussion, therefore the author have calculated him self as an informant of the event.

Documented data

The documented data consisted mainly from recorded email discussions, presentation slides of ESCI initiative, ESCI board meeting memos, other related documents from ESCI professors and all the much of the material that was procured during Energy Garage concepting, planning and building phases. These materials were the main source for building the timeline of ESCI with dates, event descriptions, and budgets on along with others. Along with specific information useful for the timeline building, for example email discussions and ESCI board meeting memos revealed an insight to the attitudes, crisis, positive emotions and other affluent data enriching the story of ESCI.

In the email discussion the primary topics were discussion of the ESCI's research projects topics, deans communication disseminated from ESCI leader to the ESCI board, board meeting recaps and ESCI projects process updates. Some of the email

discussions were more informative form reporting facts, some were multidirectional communication and expressions of opinions. The former was useful in this study to track the development of ESCI through the factual development process, whereas the latter to understand the deeper relations between events, actors and organizational structures.

Documents, such as presentation slides about ESCI intended to varying stakeholders; budget reports; meeting notes or project documentation, mainly were used to extend the understanding of the factual matters of ESCIs operation and structure. Nevertheless, with increased understanding of the whole phenomenon, through analyzing the facts the relationships between different development factors became clearer.

Interviewee selection

The data was sources, or namely the interviewees were identified as key informants through data sampling, or *interviewee selection* as it is referred in this section. It followed partly the theoretical sampling method introduced by Glaser and Strauss (1967) by identifying the purposeful data sources based constant theory building from the cumulating knowledge of the subject. As also mentioned in the first part of this section, these data sources, or in this case informants, were not selected based on their personal characteristics, but rather on the academic disciplines and types of groups that they represent.

The initial interviewee selection criterion was narrowed down to the essential actors in Energy Garage development and operation. It was based on the possessed knowledge among the research team members of Energy Garage's history and its key actors. In that stage also the research focus was in Energy Garage, due to the then prevailing interest of the topic.

As well as the internal knowledge, the part of the documented material; email discussion, participant lists, and other descriptions of ESCI's operation; that was gathered prior to the interviews provided 'signposts' for the interviewee selection criterion. Based on the initial interviews and the documented material a long-list of potential informants was gathered. The list, which was constantly updated and in the end contained 51 names, was used to categorize these potential informants into groups after their organizational position and role in ESCI's development story.

Theoretical sampling was especially used with the basis on the information received from the conducted interviews. Interviewees' description of events and people taking part in them guided the research more towards the topics related with the reasons behind ESCI emergence and its adaptation to the dynamic managerialistic environment of SCI and Aalto. Therefore the later interviews mainly concentrated on the ESCI professors, the deans of SCI and SCI's administration managers and assistants. At the same time with the changed sampling criterion the theory grounded in the empirical data iterated towards its final form.

2.4 Data analysis

The data analysis followed the principles of Gioia method set by Gioia, Corley and Hamilton (2013). Their method includes four steps, each aiming to condense the myriad of gathered data to form *1st –order concepts*, *2nd –order themes* and ultimately *aggregated dimensions*, which together from the basis of the grounded theory, the *data structure*. In this study the last two steps was merged together, since more broad conclusions better fit the objectives of this study.

The analysis started by using open coding to all the interview and observed event transcribes; i.e. selecting codes and naming them without any specific theoretical in mind and basing the selection on researchers own interpretation of the data (Corbin & Strauss, 1990). After the coding each transcribe, the coded quotations were gathered in a single excel-sheet and each was shortly commented, summarizing their content. As a result, a list of 442 quotes was formed, and each further categorized in 20 different categories in order to help the researcher to outline the myriad of data into more understandable 'data chunks', including categories such as 'ESCI process' and 'Funding'.

In the second phase, these quotes analyzed using axial-coding, meaning that they were further gathered under, what Gioia, Corley and Hamilton (2013) calls *1st –order codes categories*, which aims to create concepts that could help to describe the examined phenomenon. Altogether 78 different 1st -order categories were identified that each short and rough descriptions of the found phenomenon qualities. They included categories such as 'ESCI research too small for real impact', 'Dean's role in managing initiatives is big' and 'Shift in University direction'.

Finally, these 78 1st –order categories were compared side by side in order to recognize possible overreaching patterns and novel findings. They were merged into 11, more general aggregated themes, each representing an essential finding concerning the factors that affected the operation or development of ESCI. These themes included findings such as ‘Top down management increases mistrust in the organizational bottom level and the opacity of the structure’, ‘ESCI led to various outcomes with differing value to the participants’ and ‘ESCI spirit: Open to everyone, trust in people, high excitement but varying ambitions’.

3 Empirical findings

The empirical part discusses the birth and development of Aalto University School of Science's energy research initiative, ESCI, in the organizational context of Aalto University and the School of Science. It forms a structure of six sections that tell ESCI's story in in chronological order, and as described in the Material and methods section, emphasizing how its participants experienced the events along ESCI's development path. In addition to the empirical description of the story, it is visualized into timeline illustrations that are presented in the Appendix.

3.1 Aalto University as the research context

3.1.1 Birth of the new university

The context of the empirical study is Aalto University, a merger of three universities of business, design and engineering. The idea of the cross-disciplinary university combining business and technology was already discussed in the mid 1800's, by the time of establishing Helsinki University of Technology, as was mentioned in a final report, "*Korkeakoulusektorin rakenteellisen kehittämisen kotouttaminen – vertaileva tapaustutkimus*" by Paulina Koschke and her team (Koschke et al., 2012) . Hence, it was not truly a novel idea when Yrjö Sotamaa, then the rector of University of Art and Design Helsinki, in his university opening speech in September 2005 suggested establishment of a new university combining the three universities of Helsinki University of Technology (HUT), Helsinki School of Economics (HSE) and University of Art and Design Helsinki (UIAH) . He addressed innovation, business cooperation, autonomy and increased funding as the new university's main benefits of the suggested new university, which he described as

"A creative union of design, technology and marketing."

Yrjö Sotamaa, rector of University of Art and Design Helsinki (2005)

Principle Sotamaa's suggestion did not come a total surprise since already few months before the Finnish Council of State declared in its principle statement, concerning research and development improvement, it suggested that some university structures should be integrated in order to increase synergy benefits and multidisciplinary research entities and their strategic management was to be renewed

to meet the demanding needs in changing operating environment. In addition to university structure integration, the statement set a goal for the whole university field to become a top-of-world, regenerative system producing constantly novel research initiatives. According to the statement, universities were supposed to strive to increase their international competence by improving quality of research, increasing the number of internationally high-level research personnel and by profiling their research to key focus areas. In return, universities' jurisdiction over their finances would be increased. The statement was as based on work of Research and Innovation Council's evaluation of the state of public research structures during 2003 and 2004. The coming university reform was taking its shape.

Almost as a continuation to the Research and Innovation Council's work and Council of State's principal statement, Organization for Economic Cooperation and Development (OECD) begin their Reviews of Tertiary Education in Finland during 2005 (Davies et al. 2006). In its results, OECD suggested Finnish government to increase the strategic leadership and their operational and economic autonomy of the universities and to do so, change the form of the universities into autonomus, non-profit foundations. As well as the Finnish Council of State, OECD in its report suggested to combine universities in order to increase the impact of university research and to strengthen the resource base.

In the late 2006 the minister of Education Antti Kalliomäki set up a planning group, led by Raimo Sailas from Ministery of Finance and as a member including rectors Matti Pursula from Helsinki University of Technology, Eero Kasanen from Helsinki School of Economics and Yrjö Sotamaa from University of Art and Design Helsinki to prepare a proposal for combining the three universities into a new, multidisciplinary, top-university. The planning group set an aim to create a foundation for the birth of world-class research university. They introduced a suggestion that top quality basic research should be the main priority of the new university, followed by education, in the ministry's clearance report, "New university in the field of technology, business studies and art and design". Surprisingly, the suggestion did not emphasize innovation and applied science as was discussed in the initial public debate before the planning phase. Although aiming

high among peer universities, the planning group pointed out that their proposal requires long-term contributions to achieve the goals.

In the spring 2007, Finnish government, led by Prime Minister Matti Vanhanen, made a decision to establish the new university, which was later in 2008 named Aalto University. The decision of establishing Aalto was part of a larger change in Finnish university education policy called "University reform". The reform followed principles defined in the spring 2005 by the Council of State, and in 2007 the principles were further defined to a draft a law for Finnish universities. In essence it was carried out in order to ensure economic and structural conditions to create good quality basic and applied research in multidiscipline research fields in Finnish universities. Higher economic autonomy was an important factor for these conditions and thus the reform included a change in university management policy as a shift from state departments to foundations under civil law. The change also meant that funding of the universities would be competitive and emphasis would be placed on the quality and effectiveness of research and education.

Aalto University was the prime project of the university reform and with that status gathered all together 700 million € funding from which 500 million was granted by the Finnish Government. The large funding guaranteed the exclusive position among Finnish universities as the main support of Finnish technology industry and in general foster the Finnish competitiveness.

The rapid merger of three previously autonomous Universities also caused some issues. In their study of Aalto merger, Koschke et al. (Koschke et al., 2012) found out that the organizational change, when establishing Aalto University, increased the number organizational bodies inside the university. Some of the university employees taking part to their study suggested that the change have being towards even longer chain of decision-making and more complex organizational environment. This stands in contrast to the original proposal handed by the planning group of university fusion from The Ministry of Education, which proposes that by implementing a light management of the university and having a common support services, resources would be released for research and education. Nevertheless, increasing control was seen as an asset by the university management, since it

enabled to thrive towards bigger impact through strategic goal setting, as states the Aalto University's strategy paper from 2012.

Finally, after thorough planning the deed of foundation of Aalto University was written in the summer 2008 and the Aalto management team begun their work in the autumn 2009, in the leadership of newly nominated leader, president Tuula Teeri. The management team, including the president, formed a preparation organization that created the common identity of the new university.

3.1.2 Beginning of Aalto University –strategy and organizational structure

The preparation organization, led by president Tuula Teeri, defined the mission, vision, values and the core strategy of Aalto University during the years 2008 and 2009. It aimed to become an internationally respected, multidisciplinary research university, in which research and education are developed hand in hand. Research aimed at deep-rooted, high quality basic research, while education sought to create an international and engaging learning environment that will be closely linked to SCI's research activities. Although research and education were interconnected, in practice research was still Aalto's top priority. It reflected later to Aalto's budget allocations, number of research programs as well as it was presented first among Aalto's four strategic focus areas, which were formed as: *Research Excellence, Pioneering Education, Trendsetting Art* and *Societal Impact*.

To realize its goal of high-quality basic research, Aalto chose three operational themes to pay closer attention to: Emphasize multidisciplinarity both in research and education; focus on quality control; and narrow down the research activities to specified strategic research areas. Multidisciplinary research was planned to be emphasized with interdisciplinary research programs, other research consortiums, and education by creating joint education modules among the different disciplines. The quality, namely success and efficiency of Aalto's research groups, programs, departments, schools or other organizational bodies, Aalto management planned to measure with key performance indicators, or KPIs. They measured mainly three different factors, including number and quality of international publications, progress of students' studies and total income of funding from non-academic partners. Aalto's aimed to increase its efficiency and lift its profile among international peers by

focusing on seven identified strong research areas: Information and Commutation Technology (ICT), materials, art and design knowledge, global business, health, living environments and energy. These areas were emphasized with research top units, research platforms and strategic initiatives.

Aalto University officially began operating on the first of January 2010. It was divided into three individual schools, School of Arts, School of Business and School of Science and Technology, following the old university division. In 2011 the School of Science and Technology was further divided into four schools and Aalto took its current form with six autonomous schools. The schools were: School of Arts, Design and Architecture (Aalto ARTS), School of Chemical Technology (Aalto CHEM), School of Business (Aalto BIZ), School of Electrical Engineering (Aalto ELEC), School of Engineering (Aalto ENG) and School of Science (Aalto SCI). The division of the schools is presented in Figure 1 that presents the organizational structure of Aalto University.

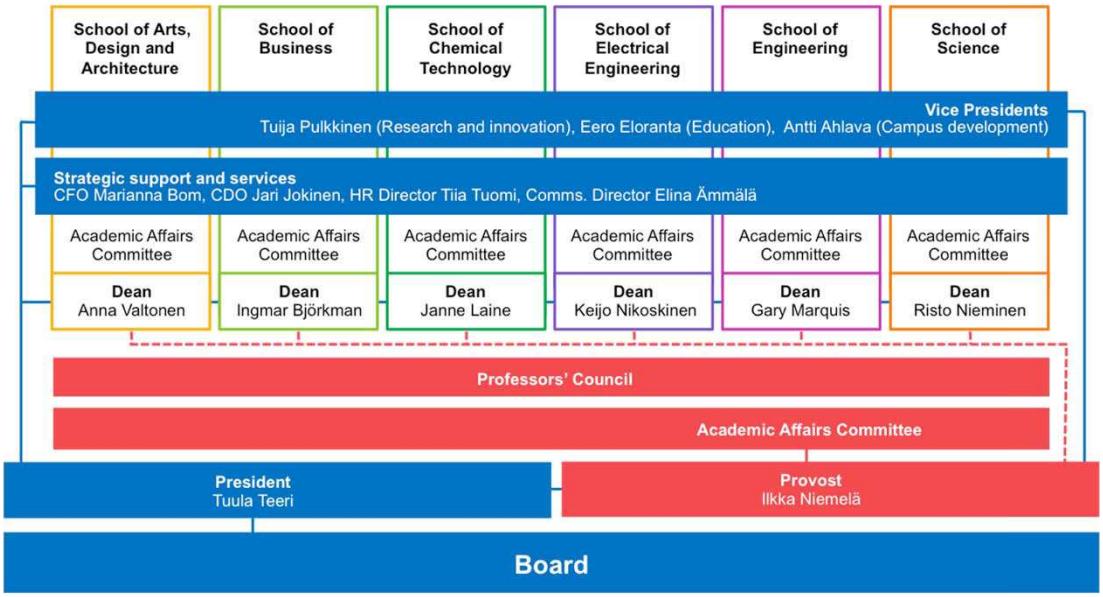

Figure 1 Aalto University organizational structure in 2014 (original graph from Aalto Strategy 2012 report with changes in 2012-2014 included in the figure).

The six schools of Aalto were autonomous, but the nevertheless operating under the university management. Aalto University's matrix organization was led by the president. Her duty was to lead the board, which makes decisions over Aalto's budget, strategy and personnel. Aalto' provost was working with the president, but

when she was responsible of “large scale decisions”, the provost in charge of “internal decisions” such as academic and educational affairs in Aalto.

Each of the six schools formed a combination of departments, working under deans and the management boards of the schools, which heads the deans are. The dean, proposed by the president and nominated by university management board, defined how each school executes the university strategy and the guidelines. The dean did it by proposing the school’s statute, appoints the heads of departments and allocates resources inside the school.

In SCI, as in other schools of Aalto, a management board led the different departments to work along with common strategy by for example allocating resources to departments, programs and projects. Ultimately, the departments, programs and projects constituted the organizational bodies seeking to realize the strategic goalsset by the university management and targeted by school management.

Aalto formed a matrix organization. The vice presidents and the strategy and service organization of the organizational bodies penetrated trough all the schools. Vice presidents were responsible of Research and Innovation, Education and Campus Development areas.

Two other bodies of organization participated in the decision making in Aalto university: the Professors Council and Academic Affairs Committee. Professors Council was an advising body consulting the president and the vice presidents in their decisions and giving the professors voice to decision making. The Academic Affairs Committee took part in deciding on the university’s curriculum, degree requirements, criteria for student selection and general rules for teaching, research and artistic functions of the university. In addition, the Academic Affairs Committee, led by the university President, voted for the members of the University Board.

The new university entailed also a new management structure. Instead of faculties organized directly below the university management, now managerial r responsibilities were divided between the new schools and university. On one hand it brought freedom for the schools to execute the university’s broad strategy, on the other it brought a new management level between the departments and the university. For the dean of SCI the change appeared in a positive light:

"It sure was interesting time (the first year of SCI in 2011). We had the faculty in the same line-up as before, but now the degree of independence was at a whole new level. We were allowed to allocate the money at the school level independently, according to how we saw that the results are produced in the best possible way"

Dean of SCI (2011-2012)

Among the professors, researchers and other university employers the change was not only about increased freedom but also increased ambiguity. According Koschke and her team's report (Koschke et al.., 2012) the added management layer increased the complexity of the organization by extending the decision-making chain. Also some of the interviewees of this study mentioned about the difficulty of working with the "system", by arguing that the processes were put in place in Aalto University – and at the school level accordingly, which made the activities 'bureaucratic, slow, and clumsy'.

3.1.3 School of Science

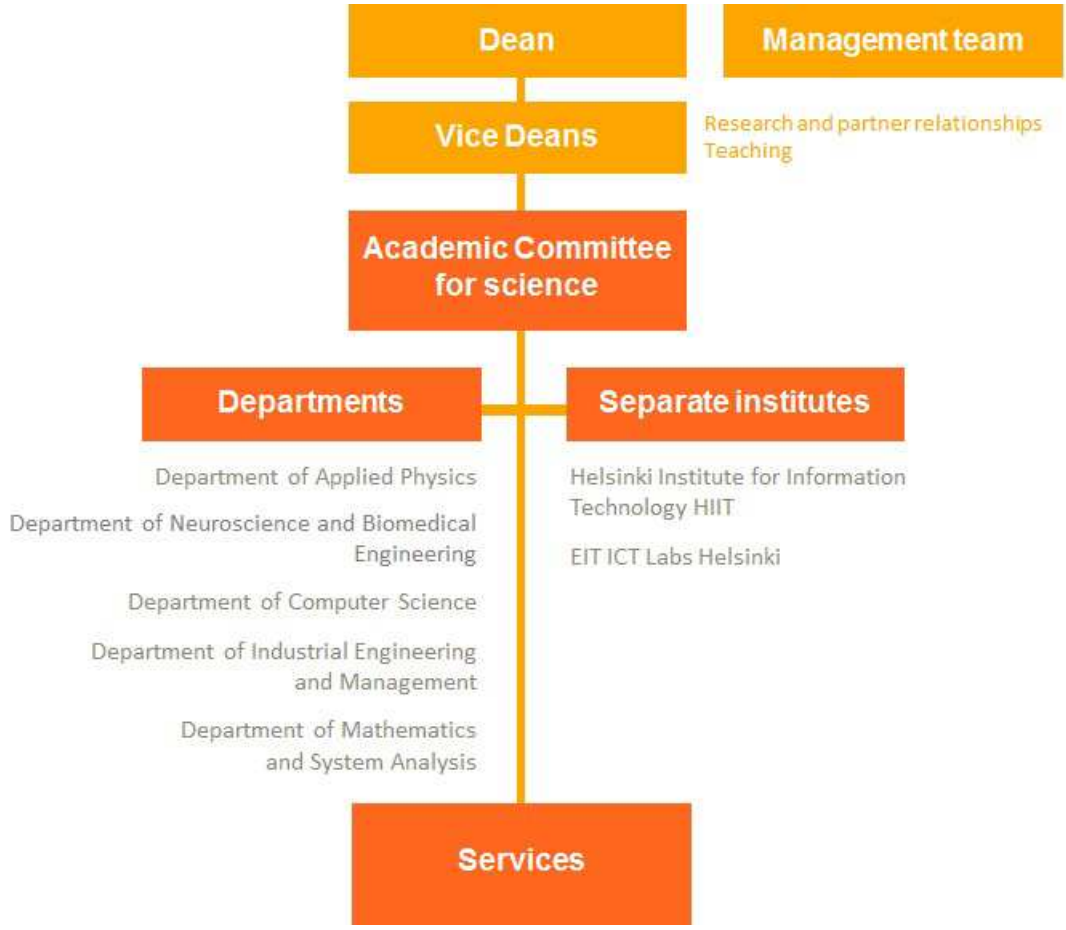

Figure 2 Organizational structure of the School of Science (original graph from SCI's website: http://sci.aalto.fi/fi/about/organisation/)

In 2011, the School of Science (SCI) began its operation under the dean, Ilkka Niemelä. The school was divided into five departments, each having their own heads of departments. The structure is presented above in Figure 2.

Department of Applied Physics (PHYSICS) is focused on field of physical science, addressing in its research condensed-matter and materials physics, quantum physics and nano-optics, and advanced energy studies. The department is strong especially in experimental research. Department of Computer Science (CSE) covers in its education and research the development of software based systems and applications, field of digital media and advanced computational methods. The Department of Industrial Engineering and Management (DIEM) is a combination of technological management, economic, leadership and organizational studies as it concentrates on creation and transformation of technology-based business. The Department of

Mathematics and Systems Analysis (MATH) consists of main research and education areas: analysis; discrete mathematics; applied mathematics and mechanics; stochastics and statistics; systems analysis and operations research. The newest of the departments, Department of Neuroscience and Biomedical Engineering (BECS) is a combination of Department of Biomedical Engineering and Computational Science and Brain Research Unit, which emerged under on department in the beginning of 2015. It focuses its research and education on Biomedical Engineering and Biophysics, Computational Complex Systems, and Brain and Mind. In addition to the departments, which both educate students and conducts research, SCI have two separate institutes: Helsinki Institute for Information Technology (HIIT) and EIT ICT Labs. HIIT is joint research institution of Aalto University and he University of Helsinki aiming to take Information technology research in Helsinki to a world-calls level. EIT ICT Labs on the other hand is European Union wide organization to foster Information and Communication Technology (ICT) education and innovation.

The School of Science, as well as other schools in Aalto, has its own strategic goals that reflect the larger aims set by the president of the university. In SCI the strategy follows Aalto four strategic areas, but focuses only on three of them: Research excellence, Education and learning and Societal impact.

Of these strategic goals, research excellence constitutes the main goal, with focus on publishing high quality papers and accruing top research teams. By 2020 SCI aims to have at leas twelve research teams ranked in the top three among their international peers.

In its strategy report from 2014, "*Strategy Roadmap for 2020*", SCI aims for example to have a large number of researchers at the top of their research field's international rankings create new research areas and to increase interdisciplinary research. SCI pursuits its education and learning goals by focusing on diversity of recruitment, developing teachers' pedagogical skills and creating learning communities. In addition to these goals, SCI declared to strengthen entrepreneurship, influence societal decision-making and improve the international visibility, and thus making an impact on society. Although these goals are defined by the SCI board and the schools is rather autonomous in its decisions, they are largely based on the overall agenda of the university. Regarding the goals of the university, the contemporary third dean of

SCI emphasized the responsibilities of the university and its units to the taxpayers and the society at large.

On the background of SCI's strategy and operation were the old structures and research culture inherited from the old faculty by the time of HUT, but influence of the merger of the three universities and the overall university reform is significant as well. Initially, when the university reform and preparations for Aalto University began, the main motivation to merge the three universities and establish Aalto was to create an innovation university, which would emphasize company partnership research and support the Finnish economy. Later, when Aalto was already being formed and started its operation, it shifted its focus towards basic research that grows from academic freedom and too strong company partnerships were even seen as a threat to the research's freedom. The new direction was not in the line with the old course of operation where the research teams were fully supported to form partnerships. Aalto began to encourage the research projects in the schools to look for the funding for example from Finnish state programs such as TEKES and Finnish Academy as well as from the university's own research programs.

Aalto management's influence was substantial not only on the school's operation in the beginning of 2011, but also on the subject of this study, ESCI, when the president urged the schools to find their focus areas. In SCI energy was one among them. The dean of SCI of that time described it as a clear order from the university management.

"A clear order came that we should not cover all the possible areas (of research and education), but to think about our profile. Where are we strong. How could we strengthen and take advantage of the strengths."

The dean of SCI (2011-2012)

In support of school-level focusing, Aalto management allocated funding to schools to for strategic operations, leaving the more specific allocation of resources on the discretion of the deans. The new funding allowed the schools for example to start new programs and initiatives to develop their operations. In SCI, to strengthen its

focus areas in research SCI's management decided to establish strategic initiatives, the spearheads of the identified focus areas.

3.1.4 Strategic initiatives

In 2011 five strategic initiatives were planned in SCI to begin at 2012. They were being established to leverage Aalto University's support for the schools with a separate strategic budget that was intended to help the schools to strengthen their operations and supporting the profile lift. To SCI these strategic initiatives were tools for the school to pinpoint the strategic focus areas in such a way that all of its three strategic priorities – research, education and societal impact – were covered. Driving forces behind establishing these initiatives are the scarce resources, which make it efficient to focus overlapping operation, as well as the set KPIs.

The strategic initiatives were granted with a funding for three to five years. This so called "3+2" system was intended to ensure that the strategic initiatives did not remain dependent on the school's funding, but would become autonomous organizations latest after five years of operation. The idea was to provide the initiatives a seed funding that would help them to build on a strong external funding in the end of school's funding period. The seed funding system includes that after the first three years, their operation is evaluated and only extended with two additional years if the operation proves to be promising. The dean of the school is leading this evaluation.

The evaluations were the primary form of communication and control between the dean and the strategic initiatives. In the strategic initiatives communication was the responsibility of the boards of executives, who were appointed to manage each strategic initiative. The boards were independent in making decision about the activities, people and distribution of funds, but they had to seek for the dean's approval on the decisions. In most of the strategic initiatives the head of the board held most of the decision-making power and was the communication link towards the dean and other management of the school and the university. In some initiatives, a hired assistant or other administrator was carrying out this task. The head of the initiative board was the activator inside the strategic initiatives coordinating and keeping the strategic initiative participants working on the same goal. In addition, the

head also played the role of an ambassador, communication and promoting the strategic initiative inside and outside of the school's organization.

In 2011 Aalto's funds seemed to be greater than ever before or after that, as was described by Kimmo Kaski, then leader of one of the initiatives and the dean of SCI in 2012-2013. The abundance of Aalto's funding support made possible to start as many as five strategic initiatives simultaneously.

> *"Then Aalto had money and it felt like the sky is the limit, there was such considerable amount of money. If one attempted to drive (new initiatives) through today, I believe it would be much more difficult."*
>
> Leader of ASCI and the dean of SCI in 2012-2013

During the 2011, professors from five strategic areas were selected to form these strategic initiatives in 2012. They were three research organizations: Aalto Science Institute, Aalto Brain Center, Aalto Energy Science Initiative and two purely educational organizations: Aalto Ventures Program, and Student care programme. In Table 4 the organizations initiated along with ESCI are listed with descriptions of their operations.

	Name	Purpose	Leader in 2012	Operation
AScI	Aalto Science Institute (org. Aalto Science initiative	Advances interdisciplinary international collaboration in science	Kimmo Kaski	2012-
ESCI	Energy Science Initiative	Enhances multidisciplinary research and education in strategic topics of energy	Peter Lund	2012-2014
ABC	Aalto Brain Center	Advances translational research in neuroscience to provide new commercial solutions and clinical applications for brain research	Riitta Hari	2012-
AVP	Aalto Ventures Program	Provides minor program for students in international, cross-disciplinary entrepreneurship	Olli Vuola	2012-
Student care programme	Student care programme	Eases students education path by creating support network and advancing teachers pedagogical skills	Eero Eloranta	2012-2014

Table 4 Names and descriptions of the strategic initiative organizations in SCI that started along with ESCI

Aalto Science Institute was established to enhance the international collaboration in SCI in all of its scientific areas. It aimed to advance the interdisciplinary mutual understanding with researchers visiting and students internship programs. ESCI was a research initiative aiming to gather together and accumulate the wide spread energy research in SCI within a single organization. The more profound view on ESCI, the subject of this study, will be discussed later on in the text. Aalto Brain Center was a direct continuation of its predecessor aivoAalto, which was Aalto University's multidiscipline brain research project that was started in 2009. It combined the brain scanning knowledge of SCI to the knowhow of financial decision-making methods in the School of Business and to the cinematography and interface design experience in the School of Arts, Design and Architecture. The old aivoAalto's operation was partly overlapping with Aalto Brain Center's operations and thus it only fully launched its operation between 2013 and 2014. Aalto Ventures Program, one of the two purely educational initiatives started in 2012 is a center of entrepreneurship studies. It was established to centralize the education of high-growth entrepreneurship in one minor program. The second educational initiative in SCI was so called Student care programme aimed to ease the study process right from the beginning by developing and implementing tools that create a support network for the students.

3.1.5 Funding strategic initiatives

In 2012, Funding of the strategic initiatives and the strategic research programs differs in the way of execution. In the Figure 3 the funding flows of these organizations is illustrated using the Aalto wide strategic research program and SCI specific strategic initiative as an example.

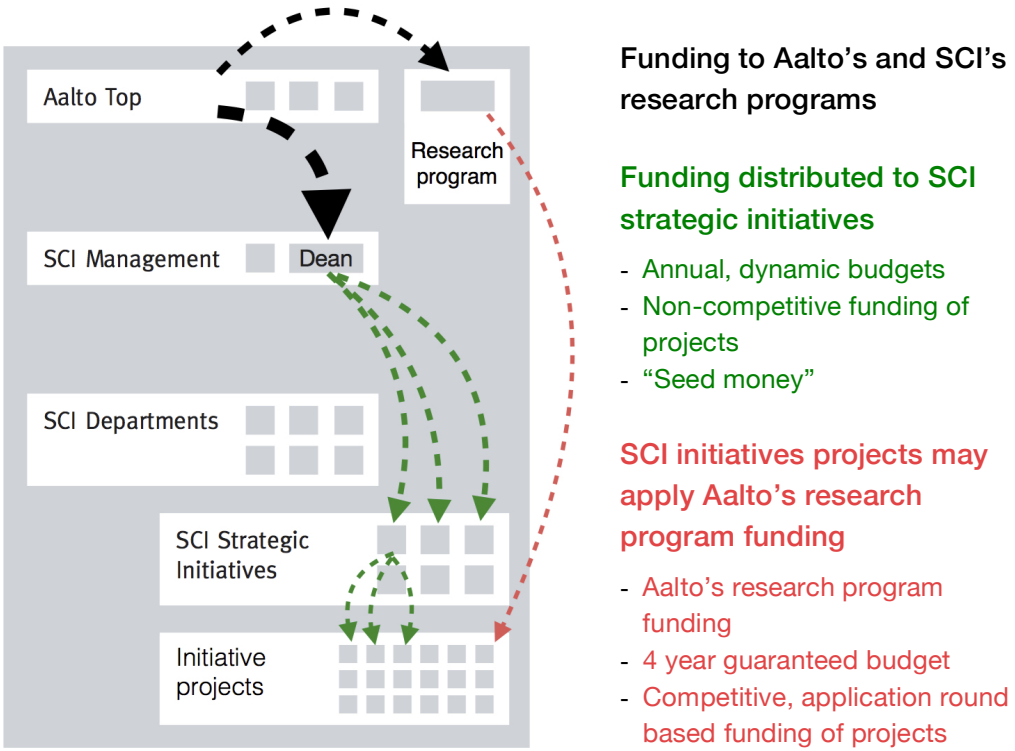

Figure 3 Funding flows to Aalto's and SCI's research programs

Aalto's research programs were so called joint units meaning that they were operating on top Aalto's schools and directly under the Aalto management, and thus also they are directly funded from the university budget. SCI strategic initiatives such as ESCI received their funding from the school's strategic budget by applying it annually from the dean of SCI. Compared to the Aalto wide programs the SCI's initiatives funding was depended on one more level of decision-making in Aalto's organization, which caused added uncertainty on their annual budgets.

Aalto granted budgets to its research programs, which they on annual basis allocated further to research projects operating within then. The funding from Aalto's budget was not "ear-marked", meaning that the funding was given to programs without obligations of how they distributed it. The goal of the block funding was to guarantee a four-year continuation of it, in order to provide the projects latitude to conduct the research without further applications and give confident to hire the required amount of researchers for the team. For the research teams that of the projects, the application of the funding was highly competitive, and the scope of the objectives had to be set to meet the criteria of the program. Naturally the application process also had an effect on the research itself. The criteria and the selection process of the

projects urged them to preset the direction of the research to a path that followed the program guidelines. The projects that could apply for the funding can be working in the departments or then for example in organizations such as ESCI. The only criteria for the teams was that the members have to come at least from two to three different schools to form a multidisciplinary research team around the project.

The funding of SCI' strategic initiatives', including ESCI's, projects was a different and somewhat more complex. The funding of the strategic initiatives did not come directly from Aalto budget but from SCI's strategic funding budget, a strategic funding instrument granted by Aalto's Management Board to the schools to support their strategic actions of advancing in key focus areas. Although, the Aalto's management did not directly earmark the funding to specific strategic initiatives, it obliged SCI to use the strategic funding for the funding of significant initiatives, for example starting a new field of research, typically for a period of three to four years. At minimum the funding were supposed to be in total 500,000€. The obligation included that to Aalto's management SCI had to present clear project plans of the initiatives it funded, including expected academic result and the funding plans during and after the strategic funding period. The plans were annually presented to Aalto's management board before the board decided upon that year's strategic funding amounts.

In SCI the strategic funding budget was partially used to support the strategic initiatives, such as ESCI, partially for example professors sabbatical leave and infrastructure development program. The strategic initiatives applied for their funding annually, every autumn, from the dean of SCI who made decisions over the distribution of the current years strategic funding budget. In 2011, when the initiatives were being formed, the dean gave them a preliminary promise of continuity of funding for three to five years, but the amount of annual funding was not guaranteed. The funding decisions were about to be made based on current funding amount from Aalto and the performance, prospects and current suitability for Aalto's and the school's other operations.

The initiatives were independent in deciding how they eventually distributed the funding that they received from the school. For example in ESCI there were no preset criteria, such as in Aalto's research programs, for what types of projects was

funded. Nevertheless, ESCI's operation plan, including the project descriptions, had to be approved by the dean. The projects received their funding from ESCI based on discussion in ESCI board where the projects are discussed thoroughly and their need for funding was assessed. In this assessment the head of the board had the final word and he suggested the annual budget on the projects and for the other activities of ESCI. The freedom of research direction that came with the noncompetitive funding was at the same time liberating but also restricting when the uncertainty of the funding restrained the possibility to hire full time researchers. The uncertainty also restrained the independence the ESCI projects had. They were not only dependent on the openness of the communication channels between the head of the ESCI board and the dean, but also on the course of budget negotiations between SCI and Aalto management where SCI's strategic activities were represented. Thus, for example a new direction of Aalto's strategy could had an affect ESCI's ongoing projects on a yearly basis.

In summary, initiatives were established on the basis of abundance of funding in the beginning of the new university. In this abundance also the "*crazy ideas*", as one ESCI's professors referred to ESCI's activities, could be supported. By giving freedom to the initiatives to organize their activities themselves, the school saw the long term value they could bring and trusted the initiatives to develop autonomic organizations with external funding sources.

With the Aalto's request to its newly divided schools to find their focus areas in 2011, emphasis on energy research was returned on the agenda. In SCI, energy was one of the identified focus areas and in the spring 2011, SCI's development manager followed the SCI dean's instructions to began to assemble the spread out research of energy and its professors together.

3.2 Formation of Energy Science Initiative (ESCI)

As described by a now retired development manager of SCI, the importance of energy research was identified and the foundational stone of ESCI was set already in strategy workshop of the Faculty of Information and Natural Sciences of HUT held in late 2008. The workshop was led by two consultants who, along with the dean of that time, heads of varying departments of the faculty and executives of different

research departments were ideating new ways to streamline the faculty's research activities by removing overlap and focusing on key research areas. The workshop concluded that a lot of energy related research was being conducted but it was too widespread to have a significant impact. Energy related research was conducted in study areas such as material science, energy systems, energy marketing, and energy production and energy consumption. The final report of the workshop suggested gathering the research activities together in order to strive towards international level in energy research in the upcoming Aalto University.

With the dean's mandate his development manager invited the professor of Advanced Energy Systems from the Department of Applied Physics, Peter Lund, to lead and develop a strategic intuitive around energy theme. For the development manager, who was seasoned and proactive networker among the SCI staff and management, professor Lund was a clear choice for leading this new initiative. Peter Lund had almost 30 years of experience from energy research in the university, a passion for energy innovations, as well as was know in public media and popular among university students.

Later on in autumn 2011 professor Lund, in collaboration with the development manager, evaluated the status of energy research in Aalto and SCI and wrote down the outlines how it stands among the international peers and how does the university's long-term strategy fit to the planned initiative. They concluded that internationally energy research in universities was typically 10 to 20% of the university activities and in some universities, such as MIT in United States and Skoltech in Russia, energy research was supported by energy programs and centers. In Aalto, respectively, 200 persons were working on the field of energy research covering 10% of all the research activities and 15,000,000€ budget. Majority of the research is done in the Schools of Engineering and Electrical Engineering, but in the School of Science it is a major research area as well. When they summoned up the outline of energy research in 2011, there were two professor chairs for energy studies with Bachelors, Masters and Doctoral programs in the Department of Applied Physics and several other research programs across other departments. Professor Lund and the development manager were planning the coming intuitive, they identified five potential strengths in energy research fields in the School of Science;

including nano- and micro materials, energy production, computational science, energy systems and risk management.

Their preparatory work concluded that although much of the research was already reaching for the international level of excellence with internationally connected professors, it was dispersed across different departments of the school. Furthermore, research on energy was lacking a common focus from the school's strategy and thus a contribution to a common goal was not possible, which would strengthen and increase the volume of energy research in the school. In addition to the dispersed research, the realization of the multidisciplinarity was one of the motivations to combine and streamline the research under one common initiative. Energy theme covered all aspects from human behavior to energy market and from material to computer science. Thus, the overall intention was simply to lift the profile of energy research in SCI by tackling the identified issues.

3.2.1 Establishing ESCI

For this basis, the development manager convened a meeting among professors of SCI working in energy projects where a common strategy and plan of action to create a cooperation and synergy would be formalized that was later communicated to Aalto University's Executive Board through the vice president of academic affairs. The meeting was held in September 2011 with eight professors from the departments of Industrial Engineering and Management, Applied Physics and Computer Science. The participating professors later on formed the management board of ESCI.

Professor Peter Lund had prepared the agenda of the meeting and presented the starting point for the formation of a strategic initiative around energy. In the meeting, the professors decided upon the establishment of the strategic energy initiative, Energy Science Initiative or ESCI that would start its operation in the beginning of 2012. Its operation form would follow a model of Aalto Institute for Advanced Studies, which defined its organizational structure, governance principles, forms of activities, scope of activities and financial resources. In the initial plans prepared by professor Lund and the coming board, ESCI was constructed around two major research themes, Materials in Energy and Energy, Systems and Society, which both had being identified as potential strengths in energy research in the School of Science, but now could be jointly studied across department disciplines. The plan

included an aim to form the first joint-topics during the first-half of the coming year, which would in the end form 4-6 grater thematic research areas.

In ESCI's board visions a flexible center-type organization would be the most effective setting to mange ESCI's activities. The so-called *Energy Center* would be not itself host energy research but enable it in separate research groups by bringing in critical sources and know-how. Energy Center was planned to be a platform that would pull the energy research together to create a critical mass and thus accumulate an internationally recognized position for Aalto University in energy research. It would support three major merging factors that ESCI was aiming for: Top-level research; High-profile education and training; and High societal relevance and impact. With the operation performed in Energy Center, ESCI was not only aiming for major impact in Aalto, but also to have effect on both national and international operation level. Important for ESCI was that the research topics would emphasize technology-driven issues that could potentially be translated to business applications.

By 2015, ESCI aimed to grow the Energy Center to be a network of 40 internationally connected researchers and by 2020 highly valued organization of 100 or more researchers. The growth goals included an aim of 3 million € funding when the center would be fully operational by 2015. 1 million € of that founding would come from Aalto's strategic funding and the rest from external sources and co-funding of ESCI's research groups. Later, the balance would sift more towards external and co-funding sources, which would cover 75% of ESCI's funding after five years of operation. The large, one plus two million budget concerned only years from 2013 to 2018, when the first year, 2012, was planned to be a ramp-up year with a smaller budget of 300,000. ESCIs plans covered only the first five years until, after which its operations were to be evaluated based on ESCI achievements and decided whether to extend them or close them down.

The vision of ESCI also followed Aalto University's strategic vision in which *Research Excellence, Pioneering Education, Trendsetting Art* and *Societal Impact* are the driving forces of Aalto's operations. The main focus in ESCI was to contribute to the Research Excellence by creating research platforms working around two major themes; Materials in Energy, and Energy, Systems and Society; which would all operate under the Energy Center. The themes of the research were based on

the existing research and interests of ESCI's board member professors. Such interests were for example: Green IT; IT in Energy; Sustainable Green Aalto Campus; and Safer Nuclear Energy. Pioneering Education was about to be driven forwards by building first a Minor subject in multidisciplinary energy science starting from 2013, and later on establishing a Master's programme by 2017 which would have a leading role in EU's energy education and would attract students from foreign universities as well new students in Finland to begin energy studies. Trendsetting Art in Aalto University through ESCI was planned to be carried out by contributing to the development of Aalto's green campus and by expanding he research to across the disciplines to research schemes where science and art meets. ESCI aimed to create a Societal Impact by growing the awareness, both national and international, of energy technology and by implementing the technologies to consumer level with good management, strong business plans and marketing. Technologies were not developed only for the large corporations but also to create environment that would foster innovations for start-ups. In ESCI's plans an environment and space to support these innovations was called Energy Science Factory. The summary of ESCI vision, as it was set the first ESCI meeting is presented in Figure 4.

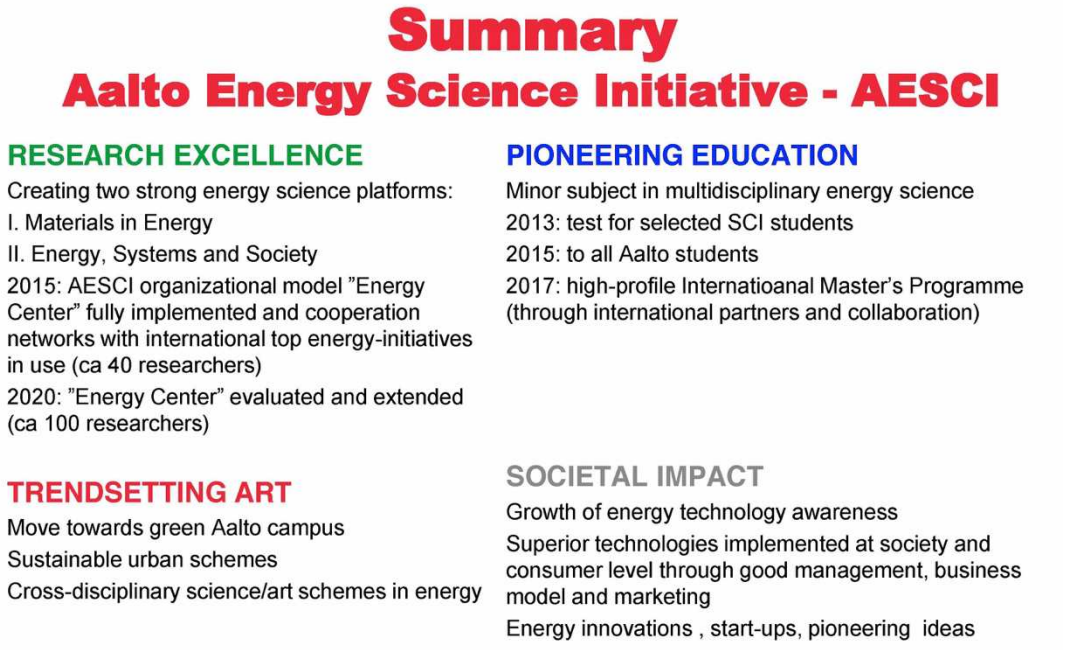

Figure 4 Summary of ESCI vision that was set in the first ESCI meeting (original figure from the data material)

During the planning phase the atmosphere in the meetings was described, by the participants, as enthusiastic and spirited about the new research opportunities ESCI was about bring through collaboration. Some participants, such as the development manager even called the meeting one of the most positive memories of time she worked with ESCI.

> *"In the beginning there was somehow a very positive atmosphere, particularly in that first meeting – Because many actors I was surprised of expressed a clear intention toward multidisciplinary research, which, as we know, is not always self evident. I though this could really turn into a good thing."*
>
> The development manager of SCI (2011-2013)

Other interviews of the ESCI board members display the same enthusiasm and interest in the initiative. They made it clear that the new energy initiative started off successfully.

3.2.2 Clarifying ESCI's vision

In the end of 2011 ESCI's vision of its operation got clearer, which the board formalized to a slogan: "*Towards world-class level in Energy at Aalto University*". The aim was to raise the level of energy research in the School of Science, Aalto University and in Finland in general. To achieve that, in the work plan that was drafted in the second ESCI board meeting in December 2011, one of ESCI goals was to bring the isolated energy research under one organization. It would give the researchers the advantage of exceeding critical mass to get recognized inside Aalto as well as internationally and thus potentially expand collaboration networks.

ESCI's plan was to make a difference to the traditional way of conducting research in Aalto. The new approach was captured in three principles: Firstly, it aimed to shift from money- to interest-driven collaboration, and to commit participants to collaborate and contribute to multidisciplinary research on new topics. The second principle stated that ESCI was a platform rather than an umbrella of research projects. Meaning that in ESCI the research projects would openly share their accomplishments, problems and learning with other projects, not only enjoy the support of ESCI in their solitude. Finally, ESCI aimed to create new research areas

through multidisciplinary approach with a common agenda. It was intended as the opposite of "a silo-research", which encourages to highly specialized research within academic research areas with little potential for interdisciplinary discoveries. The principal included openness, transparency and an objective to bring the recourses together to achieve the critical mass that would further accelerate the initiatives growth. The vision was largely shaped by the leader of ESCI, although undoubtedly many of ESCI's members shared his opinion. The interviewees that were working with ESCI emphasized that one important goal was to increase interdisciplinary interaction in research. However, they also have recognized that this is not so easy, as on the other hand the university's organization encourages specialization and outstanding academic research output, which often imply deep organizational silos, with deeply specialized individuals that cannot interact with other disciplines in those professional areas.

ESCI's action- as well as the budget plan that included the 1,000,000€ annual funding from SCI after the 300,000€ start-up phase in 2012 were tentatively accepted by the dean Ilkka Niemelä. The plans followed SCI's strategy and criteria that it had set for its upcoming initiatives. Towards the end of the 2011, these plans further crystallized. The core of ESCI was still to be formed around the two thematic platforms of the research areas Materials in Energy and Energy, Systems and Society. They were the key operation areas of ESCI. Through the platforms ESCI wanted to support the collaborative research by allowing participants to formulate research projects together without highly specified project themes. Inside the platforms research was allowed to take different directions, but they all were supposed supported each other rather than isolate to own small scale topics.

The educational goals of ESCI remained secondary to research platforms early on. They were still a somewhat undefined plan to create a multidisciplinary minor and later a major education programs. The same was with the Energy Science Factory, which detailed form was to be elaborated later and started in 2013. In the draft plans of late 2011 it was a platform for companies and scientist to meet to collaborate in energy innovations that would be funded mainly through external recourses.

The main activities, namely research around the two thematic research platforms, ESCI planned to be support with various side activities. They were: International

Visitor Programme, Young Student and Scientist Programme, Travel and Networking, Multidisciplinary Energy Science Education, Visibility support activities, and Dissemination and Information support. International Visitor Programme aimed to invite internationally know energy scientists to Aalto University, whereas Young Student and Scientist Programme intended to support young scientists and students to visit and make scientists exchange in world elite universities. Both of the programmes ESCI intended to be support with Travel and Networking activities that as well aimed to support Aalto's energy researchers international mobility in general. The main goal of these activities was to increase international collaboration.

It was seen necessary to support visibility through systematic activities in order to reach the internationally recognition ESCI pursued for. They included forming contacts to other energy initiatives, creating strategic alliances, drawing international energy venues to Aalto University and in general increasing presence and visibility at top level of research support, such as *National Strategic Centers of Excellence*, *Tekes* or *Academy of Finland*. The dissemination of knowledge and information about ESCI was to be done for example trough websites, invited speakers, workshops and luncheons with potential partners.

The whole process of building up ESCI in 2011 was a time of exceptional excitement in ESCI's timeline. The professors felt that they were part of something novel in the area of energy. The professors were given an opportunity to freedom of research beyond competing of the funding to their projects and adjusting the research plan to fit the funding requirements. Towards the end of 2011, the sudden new source of funding and an opportunity to be part of a promising new research program quickly gathered professors to join ESCI and form collaborations between them.

"In fact there were quite a many people involved, excited to build up the thing. Especially when it seemed at the beginning that money would be available to hire several persons for the projects."

Leader of Materials platform

With the help of the excited atmosphere, ESCI structure was build up rapidly and the ideas for the research topics were plentiful. Nevertheless, the fact that the

collaborations were multidisciplinary, it was seen difficult to find the common overall agenda to start with.

"At the beginning, it was not clear whether we are going to focus on a single topic or whether we are going to be cross-disciplinary"

ESCI board member from Materials

"And we struggled for a long time in the first meeting -- with which areas (of research) to include, and then the idea of Materials (platform) was born, among other things."

ESCI board member from Green ICT

3.2.3 Summary

During 2011 ESCI began to find its from as a part of SCI's and Aalto's organizational structure. The organizational environment and positive financial situation at that time strongly supported the unbounded and experimental research that was planned for ESCI. The management of the young university was seeking for its identity and thus encouraged its schools to identify and specialize in selected strategic areas. The urge from the Aalto management was supported with extensive strategic budgets that it allocated to its schools. In SCI, as well as in Aalto, energy had been identified as a major research topic and had a long reaching tradition as one of the strongest research fields. In SCI the leading character of the field had being Peter Lund who was also selected to lead the new energy initiative, ESCI.

To SCI, ESCI was one of SCI's five spearhead programs, strategic initiatives. All of them aimed to great substantial impact, within SCI and Aalto. Accordingly, following SCI's strategy, ESCI set ambitious goals to it self and aimed to become a major European energy research center with widely multidisciplinary topic.

Other than its leader, ESCI did not have a specific person assigned administrator to coordinate the establishment phase of ESCI. But as described by the interviewees, as a result of his charismatic leadership and the active role of SCI's development manager the ESCI professors were quickly connected together and initiated ESCI in a enthusiastic atmosphere in the end of 2011.

3.3 ESCI's first operation year

3.3.1 The management board

In the beginning of 2012 ESCI received the Aalto president's decision to officially form the management board of ESCI and start its operation. The board consisted largely from the people that were also planning ESCI in 2011. Two changes for the board composition were made in the beginning of the year, when Filip Tuomisto took the place of retaining professors Rainer Salomaa and Kimmo Kaski gave out his position to Jukka Tulkki. The professors in the board are listed in the Table 5.

Head of board	Peter Lund	PHYSICS
Board members	Tapio Ala-Nissilä	PHYSICS
	Karlos Artto	DIEM
	Keijo Heljanko	CSE
	Ahti Salo	MATH
	Antti Ylä-Jääski	CSE
	Jukka Tulkki	BECS
	Filip Tuomisto	PHYSICS

Table 5 ESCI board members

ESCI began its ramp-up year with the 300,000€ funding as was planned and granted by the dean. It started ramping up by mapping out the potential of ideas for projects that would work under its platforms that were planned to have three at this early point of its operation. ESCI's plan was to commit the first half-year in this mapping phase, or "start-up" –phase as itself called it, and then move towards "consolidation" –phase lasting until the end of 2013, in which the projects would be in full operation. By 2014, ESCI aimed to have gained enough momentum to begun scaling-up towards world-class collaborative research activities. The original growth plan is presented in Figure 5.

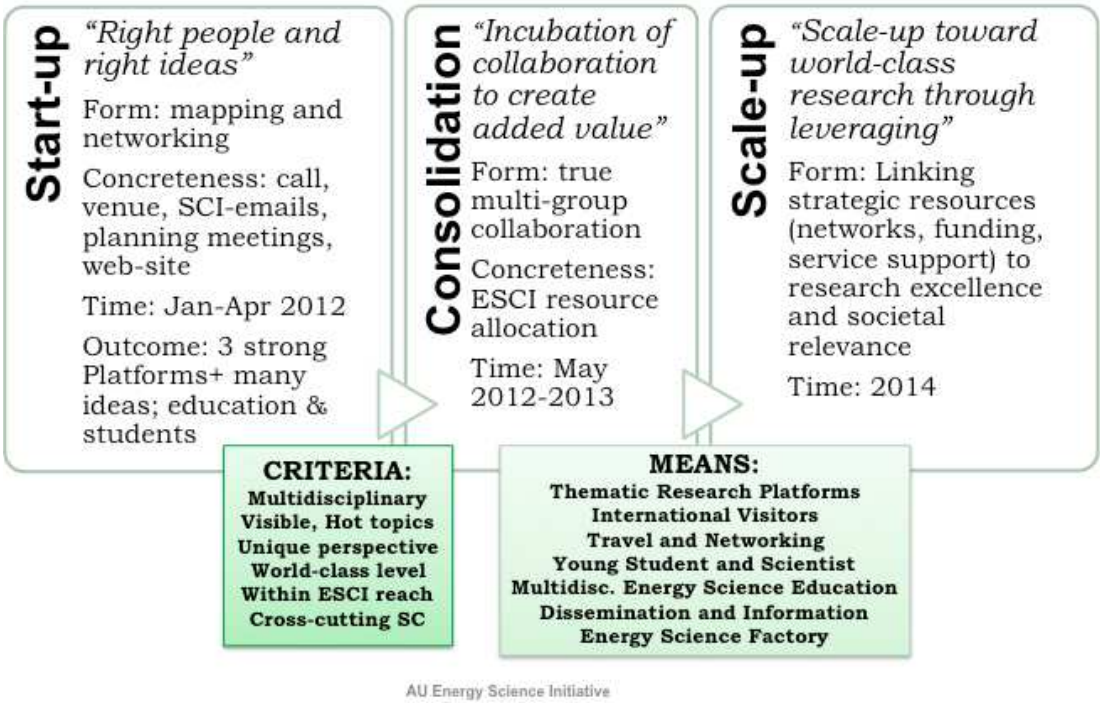

Figure 5 ESCI's growth plan (original graph from ESCI's Workplan 2012 material)

In 2012 ESCI's management was still organized to a management board, so called Executive Committee, and by its Director, the head of the board. Together they formed the decision making power in ESCI that planed and guided its activities. The plans for the management of the Energy Center with Director, Deputy Director and Management Coordinators were waiting for the operation to grow into the full scale. In the beginning, when the funds were short, ESCI kept its management in bare minimum. Since ESCI wanted to ensure a lean management of its operations and especially to save the resources for the research, no administrator was hired to control and follow-up the projects.

> *"In ESCI, the organization was kind of more loose. It was just a meeting, called a management board if I recall. -- But there was no fixed administration with hired employees to whom the director could say: 'Would you do this and this'."*
>
> The development manager of SCI

The lack of formal management arouse also from ESCI's operation principle that emphasized a bottom-up approach on management that by trusting on people new, better research ideas would emerge. In practice, it meant that all of the ESCI's

activities would be built, developed and interpreted by its participants. Especially in research, the research topics and scope were chosen solely by ESCI's researching professors without the need to show preliminary research results and expected outcomes to receive a funding. Every professor interested in working with energy related studies were welcome to join with their suggestions of research topics. ESCI participants believed that by trusting on people new, better research ideas would emerge. The open, trust-based approach meant that ESCI gathered a relatively wide spectrum different participants and disciplines.

3.3.2 Research platforms

During the spring concrete research areas began to emerge after several meetings and planning. The two initial thematic research areas had now concretized to three research platforms: *Green-ICT*, *Energy markets in transition* (Energy Markets), and *Materials in extreme conditions* (Materials). In addition, seven other topics were considered as possible new platforms, from which professor Päivi Törmä's research, *Plasmonics for solar cell enhancement* (Nanoplasmonics), was furthers in the planning. The established and planned thematic platforms in 2012 are presented in Table 6.

Theme	ENERGY, SYSTEMS AND SOCIETY		MATERIALS IN ENERGY	
Platform	GREEN ICT	ENERGY MARKETS	MATERIALS	NANOPLASMONICS (planned)
Leader	Prof. Antti Ylä-Jääski (CSE)	Prof. Ahti Salo (MATH)	Prof. Filip Tuomisto (PHYSICS)	Prof. Päivi Törmä (PHYSICS)
Research	Multidisciplinary system level research of energy efficiency	Energy investments and energy prices	Collaborative research of metal oxidation in nuclear reactors	Collaborative research of nanoplasmonic structures in solar cells applications
Planned annual budget	€225,000	€225,000	€225,00	€180,000

Table 6 Ongoing and planned thematic research platforms in 2012

Green ICT

Green ICT platform was led by Professor of Data Communications Software Antti Ylä-Jääski from the CSE. He gathered a team of eleven people around the platform and during the spring they defined the research projects' plans. Most active professors that participated in Green ICT team were professor Lily Diaz-Kommonen from ART's Media Lab, professor Karlos Artto from the Department of Industrial

Engineering and Management, professors Jukka K. Nurminen and Keijo Heljanko also from CSE and the leader of ESCI Peter Lund from the PHYSICS.

The new collaboration partnerships and the research topics, such as *Sustainable energy technologies, energy systems modeling, urban energy networks* or *Sustainable energy technologies, energy systems modeling, urban energy networks*, were new for all of the participants and the multidisciplinarity of them proved to be challenge in finding a common ground. The overall research topic of Green ICT was multidisciplinary system level research of energy efficiency in Information and Communication Technology (ICT) structures seeking techno-economic solutions. In other words, the goal was to develop and "end-to-end" solutions encompassing the diversity of stakeholders ICT systems involves. The subject covered the whole ICT chain from users to large data centers, discussing areas such as ICT theory, user behavior, ICT business models and energy systems. In more detail, Green ICT spread its research to three areas: ICT energy efficiency in a broad sense; electric vehicles; and smart-home systems.

The approach to research took an advantage of the multidisciplinary team and open-ended research topics. The wide spectrum of research in Green ICT allowed various kinds of research and with completely new multidisciplinary collaborations. For example a project with professors from Media Lab and from CSE studied Digitalisation Experiments with a scanning robot in Gallen-Kallela museum. Multidisciplinarity and through which also uniqueness of the research was indeed one of Green ICT platform's targets. The professor from Media Lab, who contributed to the social and art side of the research described the atmosphere in Green ICT as follows:

> *"You move voluntarily to one direction by being encouraged with others, in contrast to being pushed. It's the thing enables. -- I think that actually that's probably the reason why it (ESCI) has been successful. Because, on the one hand, we had the opportunity to continuously reinterpret and reinvent the agenda."*
>
> Professor in Green ICT

Research projects were quickly launched but made also possible to be quit as fast when the direction was facing a dead end. Therefore most of the research Green ICT planned to start-off with Master's Theses. If the projects were promising, Green ICT would increase the impact of the projects by hiring Doctoral Thesis works and Post-doctoral researchers. The approach to first hire mainly Master's Thesis workers also ensured that Green ICT's budget could be spread wide to start many research areas at the same time.

Establishing the platform and planning its projects took its members significant amount of time and required several planning meetings to find the common understanding about the content of the platform. Still in June, when ESCI board evaluated its platforms' progress, the board suggested Green ICT to clarify the energy dimension of its projects.

Materials in Extreme Conditions

Materials in Extreme Condition platform, or Materials as is it later referred in this study, had the most specialized research agenda between the ESCI platforms. The main goal was to understand metal oxidation from fundamentals to energy application, primarily in the harsh nuclear reaction environment. Professor of Nuclear Physics Filip Tuomisto from PHYSICS was the coordinator of the platform, who efficiently gathered a team around the platform and defined the research area.

In numbers of participating professors Materials platform was also the largest of the research platforms. Already in the ramp-up year 2012 it hosted seven professors, five from PHYSICS, one from CSE and one professor from the School of Chemical Technology. Later on the group grew larger and it became a broad group of twelve professors. The active professors in the platform were for example Tapio Ala-Nissilä from PHYSICS, Peter Lund, and Kari Laasonen form the School of Chemical Technology. The collaborative professors were mainly the same people, who have done collaborated around similar subjects outside of ESCI.

"The partners were, I could say a list of 'the usual suspects', meaning the people who we were collaborating closely with on this topic."

Leader of Materials platform

Compared to Green ICT and Energy Markets, the research was more concentrated and aiming higher in towards the international top-quality publications. The wide collaboration network that was build inside Materials platform was a gathering a high level expertise, but nonetheless focusing only on a highly specific area of research. On top of conduction research inside ESCI, Filip Tuomisto wanted the research to spread inside SCI and his department and establish completely new research area to them.

Materials platform started off well during the first half of 2012. The common research agendas were found quickly and as the platform's professors were familiar to each other from previous collaborations, also the team around its projects was easily found. Compared to Green ICT's extended planning period, Materials platform showed good progress in the beginning.

Energy Markets

Ahti Salo was leading the research in Energy Markets platform, which was focusing in on the development of a theoretical framework to identify and examine energy market uncertainties and their effect on electricity price. The overall goal was to understand facets of energy transition and find efficient solutions to manage them. The collaborating professors in the beginning were Karlos Artto from DIEM, professor Ahti Salo from MATH, professor Antti Ylä-Jääski from CSE, professor Matti Liski from the Aalto Business School and professor Peter Lund from PHYSICS. Thus, in total five disciplines and five projects the Energy Markets platform planned to be covered and set to collaborate towards the shared goals within the platform. The planned projects were for example: *Factors and mechanisms forming the electricity price*, which would apply short-horizon algorithms to proactively adjust electricity prices in a smartgrid; and a *Managing energy investment*, which was about the governance of energy investment projects and uncertainty management.

The scale of the projects was wide and the participants had ambitions to expand the platform substantially. The leader of the platform, was know among ESCI professors from his well established international contacts to major universities, such as MIT and Cambridge and Peter Lund had connections to the energy company Fortum. The collaboration between Fortum and the Energy Markets platform was being planned

by professor Lund and a representative from Fortum in March 2012. In the meeting they agreed that a proposal for collaboration projects would be later send relating to the research in Energy Markets platform.

Despite the ambitious plans and the Energy Markets platform participants' work, the platform's progress was slow compared to advancement of the two other platforms. The platform had gathered myriad of interested participants and had identified valuable elements to its planned research projects, but according to the mid-year evaluation of ESCI's platform the Energy Markets platform were still lacking synergy and focus.

Nanoplasmonics

In the beginning of 2012, Nanoplasmonics research was mainly planned by professor of Quantum Dynamics Päivi Törmä from PHYSICS, who had being researching the subject for almost a decade already. It was one of the potential new research areas besides Green ICT, Materials and Energy Markets that was identified in the beginning of the year. From these research areas it was the one that was actualized into a research plan during the spring and the summer.

The planned research in Nanoplasmonics focused on developing theory and computational methods for nanoplasmonic phenomenon that could potentially be utilized in for example LED and solar cell application development. It aimed to have five different research topics and teams working around the nanoplasmonic theme by 2013. In planning of the potential new platform, there were for example Jukka Tulkki from BECS as well as Martti Puska from PHYSICS, and collaboration with professors from the schools of Electrical Engineering and Chemical Technology were also being planned.

Research in Nanoplasmonics area went forwards already during the beginning of 2012, despite that it was only one of the potential topics that would be taken part of ESCI's portfolio later after the launch-up year. From Nanoplasmonics' research topics for example Jukka Tulkki's research was progressing even though it not yet receive funding from ESCI.

People in ESCI

ESCI's organizations was consisted of professors from 9 departments in 6 different schools of Aalto University and through co-operation a professor from Helsinki University was also involved. Altogether, 25 professors, 30 researchers and 15 students were taking part in the research. Mostly the researchers were from SCI's PHYSICS department, but also all of the other SCI departments and three other schools were represented. Some of the professors were actively part of ESCI activities, developing it further whereas others were merely collaboration partners or recruited for teaching in the Multidisciplinary Energy Studies Minor programme.

The core of ESCI was formed by the ten active professors, who created and developed the research, education and other activities in ESCI. It was largely formed in the very beginning when ESCI was being established and from which also the Executive Board of ESCI was also formed. In the first composition of the board was still a member outside of ESCI's researching professors but in the final composition all the members, including the head of the board, were also taking part on the ESCI activities. As mentioned in the beginning of this section, ESCI did not have a hired assistant or other administrator who could take care of the reporting, information collecting and internal and external communication, there fore the board members and mainly the head of the board had these task as their responsibility.

3.3.3 AEF versus ESCI

Highlighting ESCI's open platform character was how it welcomed the research platform teams to apply external funding to reinforce research on chosen the research topics. One of the external funding sources was Aalto Energy Efficiency program (AEF). It was an Aalto wide program and a coordinating organization for long-term research projects with scalable business application potential for improving energy efficiency that started separately from ESCI in the beginning of 2012. It sought for promising projects in Aalto that were doing research in multidisciplinary setting and aimed to increase the efficacy of producing or consuming energy, in its widest sense. It funded the most promising projects that were selected through two application rounds held in 2012 and 2013. The funding aimed to encourage internationalization, researcher training and to provide young researchers opportunity to focus fulltime on their research.

In February 2012 AEF called for the first applications on its four years funding of multidisciplinary energy efficiency projects and in 2013 it called applications for a second round. Altogether nine out of 91 applications were selected and these research projects were granted a funding for four years with an option for continuance. Applicants were required to convince the AEF board that their project have a significant societal or industrial impact in a way that Aalto University should expand or start research on this area right away. Also these projects were required to have a multidisciplinary approach for research and have an affect on the education as well.

The application process required the projects to deliver a description of the research problem, research objectives, preliminary plan how funding would be used, and list of researchers with their roles in the project. In essence, to meet the criteria the applying projects were ought to be rather well preplanned with an exception for certain kind of results. The AEF managing board's authority to decide upon which projects were chosen gave the board possibility to partly control the direction of energy efficiency reassert in Aalto university. According to the interviewees, the application process made AEF an organization that was directed from top to down in the organization hierarchy and that in contrast to ASCI, the management board of AEF guided the research topics and directions of the projects guided by the promise of results, not by the trust to the project participants. This made the projects narrower in research scale but also lowered their risk of failing.

In March 2012 ESCI participated on AEF's first application round with an application about the Green ICT projects. ESCI's application "*Green ICT – Leapfrogging energy efficiency through multidisciplinary system design*" was research program of five individual projects: *Distributed systems, mobile computing, Internet protocols and services,*, led by professor Antti Yläjääski from CSE; *Scalable and Elastic Distributed Computing* of professor Keijo Heljanko also from CSE;; *Sustainable energy technologies, energy systems modeling, urban energy networks*, coordinated by the head of ESCI professor Peter Lund from AP; and *Heritage ecosystem and communities in the energy chain for innovation in the Virtual Museum* that was led by only active member of ESCI outside of SCI, professor Lily Díaz from Department of Media from ARTS.

Despite the professors' efforts the application was eventually. According to the AEF board, the cooperation among the Green ICT project was not broad enough to meet the criteria of multidisciplinarity. The rejection letter suggested to apply for the next round of funding in the end of the year, and to improve the application in all four criteria areas that AEF have set for the funding. Understandably the members of ESCI who participated in the application process were disappointed by the rejection, but at the same time highly grateful for professor Antti Ylä-Jääski's precise coordination work. Everyone was satisfied for the proposal they sent. One of the professors thanked professor Ylä-Jääski in an email and emphasized how he saw good potential in the area and established connections to projects partners:

> *"Thank you Antti once more for coordinating this, I think there is quite some potential available on this area. Let's see how we could start to work towards the next round to make the proposal even stronger and maybe get some joint initial activities started among at least some of the partners."*
>
> Member of Green ICT platform

Also professors Tapio Ala-Nissilä, Jukka Tulkki and Ahti Salo; Ala-Nissilä as a project leader, and Tulkki and Salo as a members of research teams, applied funding from AEF. Their projects were related to their work in ESCI but the applications were submitted outside of ESCI. All of their projects' applications got accepted and thus they worked also with the projects under AEF funding along side with their ESCI projects.

3.3.4 Setbacks towards the end of the year

The application process to AEF funding crystalized ESCI's plans around Green ICT topic and the application to AEF was later used as such in Green ICT's research plan.

Also other platforms progressed, and by September all three of ESCI's research platforms and Nanoplasmonics proposal were defined with a detailed plan of action for their coming operation. However, setting up the action plans for the future was not the only objective for ESCI for its first operation year.

First year accomplishments and difficulties

In fact, it had set high objectives for numerous focus areas in the beginning of the year. It planned to have a minimum of two high-level visitors coming trough ESCI, three strategic visits to two network partners, build up two topical research platforms, four visits to abroad by young researchers or students, gain national visibility with at least two alliance parties, begin the Multidisciplinary Energy Science Minor program, host an energy seminar, spread awareness by opening a web page and drafting a plan for Energy Science Factory or as later know, Energy Garage. Regardless of the efforts and altogether 15 planning meetings in the first half-year, as ESCI's report about the work plan for 2013 mentioned, the ESCI seemed to reach its high level goals only partly.

ESCI successfully planned and initiated three research platforms; Green ICT, Materials and Energy Markets; and created a plan a fourth one, Nanoplasmonics, but many other objectives were partly met or not met at all. Materials research platform invited 4 research visitors to its workshops, but none of ESCI's professors made strategic visits to the thematic areas' network partners or send students or scientists to visits abroad. Also the objective to create at least two alliances with national corporations was realized to a discussion with energy research forum provider Cleen Ltd. The dissemination of ESCI's activates was minimal in the first year and consisted mainly of completing the ESCI's website. ESCI formed and management board to manage and decide on ESCI's activities, but the plans of the Energy Center with a Director, Deputy Directors and Management Assistants was not progressing during the year.

In the first half of its operation year it found multidisciplinary research to be indeed a more complicated and time consuming as anticipated. After all, collaboration over department and school boarders in energy has not being done before in Aalto University or the previous universities. The time consumption difficulties was also admitted in the report about ESCI's first year's mid-term results and about its plan for its second operation year. It concluded that time needed for ESCI's plans far exceeds the project proposals for example for the traditional funding sources Tekes or Academy of Finland, but rationalized the unexpected consumption of time with its ambitious plan to be an out-of-ordinary research organization, as the report stated:

"Planning a truly multidisciplinary energy project will require extensive pre-planning and discussion sessions, actually much more than anticipated. -- Success in an interdisciplinary effort depends on linking right questions to right people with a common interest. Just stamping an energy label to existing consortia does not meet ESCI ambitions."

ESCI mid-term report (2012)

ESCI's mid-term report also emphasized how novel ESCI's approach to energy research actually was. It stated that at SCI the understanding of energy as such is limited to narrow science areas, not spread to larger societal questions of energy. Therefor ESCI wanted to emphasize the over all relevance aspect of its activates, not just to be a funding body the most prevailing research interests. Consequently, the approach added the complexity and the difficulty of planning ESCI's operations, which then extended the time the planning, took.

Difficulties in sharing the management load were also recognized. The lack of administration that ESCI's lean management of the shared responsibility between the head of ESCI's board and the board members included, created an imbalance in the execution of the first years objectives. While four thematic research areas were defined for further operation, many concrete actions were ignored, such as organizing workshops, creating co-operation partnerships with companies and hiring post docs or doctoral students to conduct research. Many of these slowly progressing activities would have benefitted from allocating more resources to administer the day-to-day practicalities. Therefore, ESCI planned to increase resources of management by hiring an administrator or other assistant. Another alternative that ESCI's mid-term report suggested was to share responsibilities even more, so that some of the planned activates such as visits and networking would be integrated to the Platforms.

The slowness of the progress in ESCI's objectives showed also in the use of its 300,000€ funding, and by the end of 2012 only 28% of the year's funding was used. The interviewees gave varying explanations for the slow use of ESCI's money. Some felt that the loyalty of ESCI's members made them careful of spending its funds and rather used the members own, in-house contributions for example for the planning activities. On the other hand some were upset for this sluggishness in using money,

and felt that in the contrary money should have being used as much as possible, and in the best case even more than was budgeted. They though that ESCI should have cut funding from projects which clearly didn't seem to progress and concentrate the funds on the most promising ones.

> *"I can't blame any one person, but project management was, in my opinion, a failure particularly with the funding issue. We were too conservative, which backfired immediately. As a dean, I would have drawn the same conclusion (that these people don't need the money)."*
>
> Member of ESCI board from Materials

Also the hiring researchers proved to cause problems according to the interviewed ESCI board members. Whether it was because the uncertainty of the future funding didn't encourage to hire for example doctoral students which would need at least a four year contract, or because Aalto's bureaucracy hiring for example an international post doc takes up to six months to recruit.

> *"The bureaucrats should understand that -- that recruiting new people takes time. If we are hiring a foreign post-doc, it takes three to six months before we get the person here, from the moment we know (that we can hire). And the head of department will not sign the contract before the funding is secured."*
>
> Member of ESCI board from Materials

Funding proposal for 2013

Nevertheless, the collaborative work that ESCI had performed had being done with a strong dedication and willingness to cooperate. Some described ESCI's personnel to be a 'dream team' and many had a strong believe in ESCI's future. The participants felt that despite the difficulties, the progress they made in the research platforms was significant and the discovered topics promising.

In the end of the year, with a positive view for the operation in 2013, ESCI applied for 1 million € funding for its activities in 2013 from the School of Science, and as the initial plans from 2011 also stated, it aimed to leverage that amount with an

additional 1 million from external sources and possible even another 1 million through partnership contracts, once ESCI was in full operation. For the SCI management ESCI proposed a budget model where the surplus of 200,000€ from 2012 budget would be added on top of the applied 1 million €. In case the application wouldn't be accept as it was, the leader of ESCI, Peter Lund, drafted two alternative budgets for the coming year, as is represented in the Table 7.

ESCI-activities	Budget options: Proposed €1.2	No transfer €1M	Reduced €0.6M
Platforms	675	600	600
Green-IT	(225	(200	(200
Energy Markets	225	200	200
High temperature materials	225)	200)	200)
New activities	250	200	0
Education	125	100	0
Dissemination	75	50	0
Management	75	50	0

Proposed: €1M 2013 + ca €0.2 from 2012= €1.2€; No transfer: €1M 2013; Reduced: freezing all new activities, but maintaining already initiated ones, requires 0.6M

Table 7 Original budget proposal table from ESCI's work plan for 2013

In the most optimistic plan ESCI would have 1,2 million € to mainly fund the three farthest planned platforms; Green ICT, Materials and Energy Markets; and to create new research activates with new smaller initiatives inside ESCI or by allowing new entrants o the existing platforms. The optimal budget would also be used to plan and ramp-up the Masters Programme for multidisciplinary energy studies, progress in the building up of the students innovation space, Energy Garage, increase the dissemination of ESCI awareness with improved website and Aalto Energy Summit seminar, and improve the management system of ESCI by hiring management support such one or several coordinators or management assistants. The secondary budget that would not include the surplus from 2012, would still include all the same activities. With that decreased budget, and with the third, reduced model of 600,000€ funding from the school, ESCI would only focus on activities the in the three planned platforms. In ESCI's plans for 2013, the proposed funding would finance salaries of 4 project coordinators, 2 senior scholars, 3 Post-doctoral researchers, 10 PhD students and 3 Master's thesis students. With its resources, by the end of 2013 ESCI aimed to deliver 8 publications, 3 Master's theses, 4 workshops and 3 university

courses. The year 2013 was aimed to be the year when ESCI is fully operational, and based on proven value-added demonstration at the end of the next year and later, it would continue at least another five years.

Dean's funding decision

The dean, who ultimately decided upon the school's strategic initiatives annual funding, and his office staff saw ESCI's progress in its first year from a different perspective. The executive assistant of the dean described ESCI as almost invisible in the beginning compared with the other SCI's initiatives.

> *"But these other initiatives, ASCI and AVP and then Student Care, kicked off, from my point of view, pretty impressively --. I saw that ESCI was more scientifically oriented. It wasn't visible, I have to admit that I did not have a clear picture what was going on in ESCI. But these other initiatives, ASCI and AVP and then Student Care, kicked off, from my point of view, pretty impressively --. I saw that ESCI was more scientifically oriented. It wasn't visible, I have to admit that I did not have a clear picture what was going on in ESCI at any point."*
>
> Dean's executive assistant (2011-2013)

As ESCI was not as visibly represented in the dean's office, and it's progress was almost entirely assessed with by the fulfillment of its objectives and the use of the budget, to the dean's perspective ESCI progress in the first year was slow.

The image of ESCI in the dean's eyes was also affected by a nomination of a new dean to SCI in March in the same year. The dean, who was establishing ESCI and the other strategic initiatives, without a warning moved to Aalto's management board as the Vice President of Academic Affairs. To replace him came the leader of ASCI strategic initiative professor Kimmo Kaski, who's dean season was supposed to be only temporary before a new permanent dean is assigned. The new dean's short notice appointment and temporality did not, according to him and his assistant, leave time to establish proper communication channels with the initiative leaders and boards. In the beginning of the initiatives the dean and the initiatives agreed that they would give a status update every three months to keep the dean and the SCI board

aware of their progress. Because of the sudden change in the dean's position the responsibility of information dissemination towards the dean and the generally the whole internal marketing was on the initiatives' own responsibility. In ESCI's case, the connection between the new dean and the ESCI leader was not well enough established in order to maintain communication channel through which ESCI's value could be evaluated in other measures than the use funds or the achieved objectives.

ESCI among other strategic initiatives was evaluated by the dean in September 2012, who made decision on the their budgets for the next year. His decision was affected by a change in Aalto's funding levels as well as policy in funding its strategic organization parts. For 2013 Aalto based its budget on "*conservative income expectations*" as was formalized in Aalto's budget proposal from the same autumn. It expected an about a drop in the governmental funding, when Finish government decreased its additional funding for the new university's development. In addition, Aalto management expected also external research funding as well as its corporate funding to decline. Thus, SCI was granted funding for its strategic actions that was over one fifth shorter compared to the funding for 2012 when the strategic initiatives were launched. According to the first dean, Aalto was eager to decrease the funding of the budget allocations that aimed for change in Aalto's operation.

"The peak year in investing in (Aalto's strategic) change was 2012. After that the financial situation deteriorated and led to budget cuts (in strategic funding)."

The first dean of SCI (2011-2012)

In addition to the cut down budget, Aalto management made changes to the model how it funded the schools and its "*joint units*", including for example the strategic energy efficiency program AEF. In 2012 Aalto divided its funding between basic funding of the schools and funding of the joint units. In 2013 onwards Aalto allocated all of its funding to the schools, which in return were obliged to cover all the costs of Aalto's joint units in proportion to each of the school's personnel costs. The change also included a more centralized and concentrated model of management of Aalto's functions, where funds from schools were sifted to joint units in order to decrease overlap and increases efficiency. In total joint units received a slight increase in their funding whereas the basic funding of the schools decreased faced a

minor decrease. The change in Aalto's strategic funding model is illustrated in Figure 6.

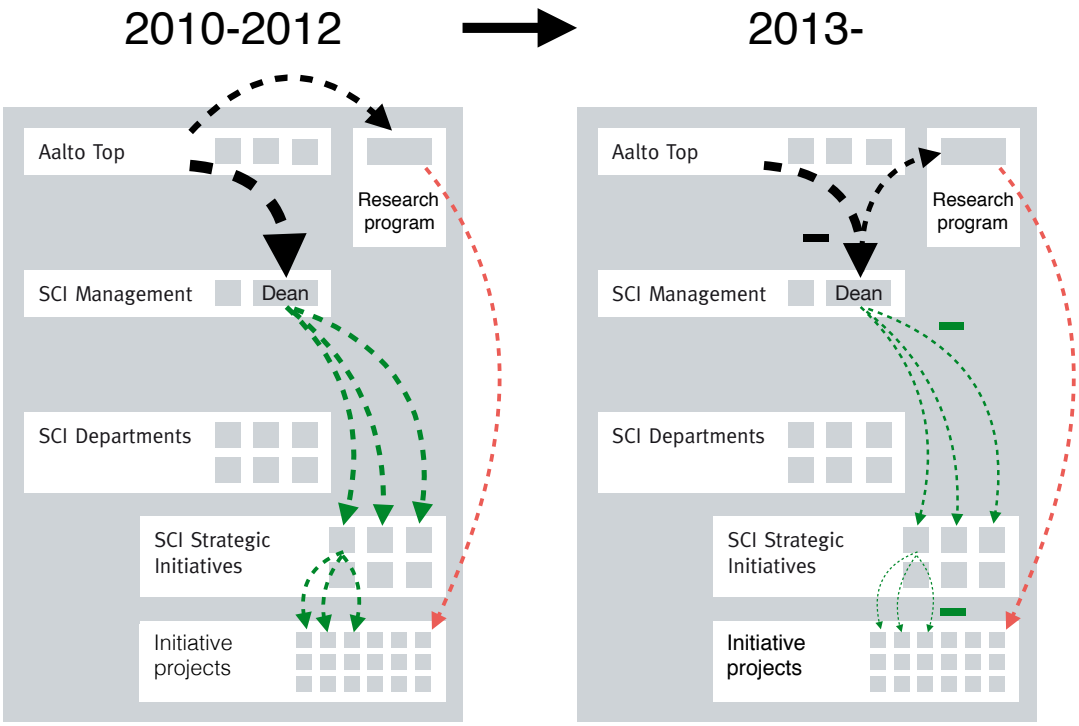

Figure 6 Change in Aalto's research programs' funding structure: First, separated schools' strategic funding and Aalto's joint research program funding. After 2013, decreased overall strategic funding to the schools, and the joint programs are being funded from the schools budget.

It was obvious that the budget changes also had an affect on the initiatives. The dean of SCI faced budget negotiations with the president of Aalto, where the planned budgets for the strategic initiatives were have to be shortened. The proportion of the budget cuts was based on the significance of the initiatives in whole Aalto's perspective and the progress the initiatives had shown so far in their ramp-up year in 2012.

Finally, in the end of the year the dean confirmed the budgets of the strategic initiatives and unlucky for ESCI it faced the largest proportional budget cuts. It was not granted more than 185 000€ for 2013, in addition to the 200 000€ surplus from 2012. The graphs in Figure 7 show he proportional cut downs of the initiatives budgets compared to their proposed budgets. The colored are between the

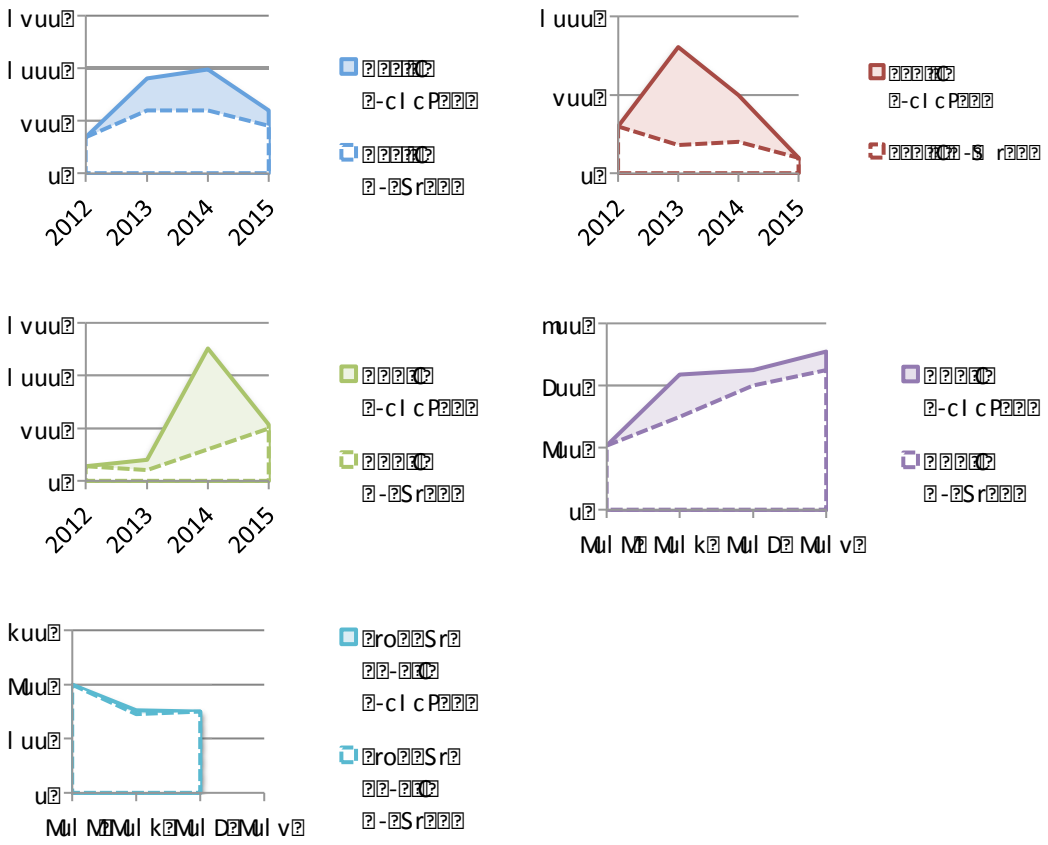

Figure 7 Difference between the actual, granted funding and the funding that the initiatives proposed to SCI for the years 2012-2015.

The relevance of ESCI as another strategic energy research initiative along side with the large AEF programme was not strong in the deans or Aalto president's perspective. SCI was with its part covering AEF's costs and in addition ESCI's project had the opportunity to apply funding through AEF's new funding round in 2013. Despite that the progress in ESCI's research efforts did not receive an appreciation from the dean, he valued ESCI's educational aspect and saw it as the ESCI's orientation that showed positive momentum.

> *"I followed ESCI's operation more from the outside and to me ESCI quite quickly, to my understanding, oriented towards the educational dimension, in which it worked very well as far as I can see, by gathering together the diverse know-how on energy topics from different schools."*
>
> The second dean of SCI (2012-2013)

3.3.5 Summary

The data suggest that at least four main reasons contributed to ESCI's budget cut. Firstly, as mentioned above, in the new financial situation where the overall budget of Aalto was decreased, the strategic, flexible parts in the university's organization, including SCI's strategic initiatives, were the first costs in the budget to be cut down. The orientation to support schools own programs was shifting towards joint, university wide programs such as AEF.

From the SCI's strategic initiatives ESCI' budget was cut the most. The empirical data suggests that ESCI the reason for it and the second main reasons for ESCI's budget cut was criteria that dean evaluated SCI's initiates supported activities that provided immediate results. In the dean's eyes, ESCI got a slow start, could make use of only third of its funding and failed to reach many of the objectives set at the beginning of the year. From some of ESCI's members' such as the ESCI leader's point of view it was mainly due to the unexpected difficulties in communicating and finding the common direction between the multidisciplinary project partners. On the other hand, some were also blaming ESCI's management that did not react quickly enough for the sluggish use of the funds, and suggested that ESCI should have on the contrary used more money than was appointed to it in order to be seen progressive in the of SCI management. Nevertheless, in the dean's eyes ESCI seemed to be the least progressive of initiatives that began their operation in 2012, which was, although abstract, the main criteria to evaluate the initiatives.

The image of ESCI in the dean's eyes was not made more positive by the low visibility that ESCI received at the dean's office. The data also suggest that the poor communication between ESCI and the dean was one of the four reasons for ESCI's budget cut. To ESCI the value of its research greatly different than how the dean understood it. The lack of transparent communication clearly increased the viewpoint difference. The interviewees described the communication being irregular, opposite to what the communication was supposed to, as was agreed between the initiative leaders and the dean in 2011. The agreed communication routines were broken when the new dean was assigned to his position in the middle of the initiatives' first operation year. In addition to the change in the SCI management, ESCI's leader was

not as active as some of the SCI's strategic initiatives' managers in presenting the progress and marketing ESCI's value to the new dean.

The fourth identified reason for ESCI' budget cut was its challenging organizational position is the school and in the university. Compared to the other strategic research oriented initiatives in SCI it was in a weaker position when the dean had to cut the initiatives' funding from its shortened strategic budget. Aalto Brain Center did not yet fully ramp up its operations before 2014 and Aalto Science Institute that was previously led by the new dean was without further internal marketing familiar to new dean him self. In addition the nature of the activities in those two research initiatives was less ambiguous that of ESCI's, which its multidisciplinarity and novelty caused to itself, and thus progress in the first year was easier to gain.

At the same time with ESCI another, much larger and the whole Aalto wide energy research program, AEF, started its operation. ESCI unsuccessfully sent a joint application to the program about the Green ICT project, but three of ESCI's professors were part of other, accepted projects. For the dean as well as for Aalto's management, which granted SCI's annual strategic funding budget, the distinction between ESCI and AEF was not clear, thus ESCI was rather seen as overlapping, SCI specific activity besides the AEF. In a situation, where Aalto was changing its funding model and decreasing the strategic funding amounts to the schools, it was a clear decision to cut budgets from there where a potential overlap was occurring. In this situation, the dean saw the greatest value of ESCI in its multidisciplinary education and student orientation that started to emerge and develop during 2012.

3.4 Coping with reduced budget

3.4.1 New plans for 2013

The significantly reduced budget and the dean's favor of ESCI's educational aspect had a considerable affect on ESCI's plans for the activities for 2013. Firstly, ESCI's goal to build up the international energy research and education cluster Energy Center had to be forgotten. With its reduced budget, ESCI could not expand the initiative as it had planned, but rather it had to make dramatic cut downs to its activities. ESCI concentrated its focus on the two platforms that got a good start in 2012, Green ICT and Materials and allocating only a small, 17 000€ funding to

Energy Markets and Nanoplasmonics research projects. Energy Markets did not accelerate enough momentum in the ramp-up year to become a full-scale platform of several projects, but according to the head of ESCI, it formed an adequate network in order to continue the planned research activities even in a reduced scale. The same went with Nanoplasmonics which operation was planned to continue around one research topic. Green ICT and Materials were to be executed also in smaller scale and focus on areas that had the least overlap with other energy projects in Aalto University.

ESCI planned to proceed with *Multidisciplinary Energy Science Minor* programme although the plans of a Major program had to be buried. The minor programme was about to be planned during the early 2013 and started with students in 2013 autumn semester. Besides the energy minor progremme, the students', companies' and researchers' energy innovation space Energy Garage were planned to be taken forwards. During the year EG was mainly a drafted idea of a space that would represent ESCI, in same manner as "*the mansions of the Renaissance age Medici-family in Italy*", as one ESCI professor, who was actively driving the idea forwards in ESCI's meetings, formalized it. For 2013, ESCI budgeted 10,000€ to conceptualize EG plans further. The 10,000€ were mostly used to join an innovation course called *MIND Innovation in Action* that was organized in the coming spring semester in Aalto's Design Factory.

The new budget and plans did not come close to the originally planned ones, which was a big disappointment to ESCI's participants. To some the cut in of the research budget also meant a significant drop in the motivation to contribute to ESCI's activities.

> *"From the beginning of the second year it was clear that (the research would not continue as planned). As a result, my interest and eagerness to put effort in ESCI disappeared quickly. It is the same thing everywhere, the amount of effort you put into something depends directly on how much you can get out of it."*
>
> Head of ESCI's Materials platform

Other's lost trust to the funding system of ESCI, when it became clear that the promised 1 million funding from the school was not reality. Also to some ESCI participants it was clear message from the dean that the research that was conducted in ESCI was not worth of being funded.

"In the beginning we promised, and this is not bitterness, but we were promised 1 million a year. To do a lot of research with! But then we find out we only get 200 000 for the first year, then 300, and 180, and so you get the feeling that even the Moscow mafia would have been more reliable."

Director of ESCI

"It is a clear message from the funder that 'you do not deserve the money'-- Because, to my understanding, it was completely the dean's decision, the dean could have kept the budget as it was, in principle at least."

Professor in Materials platform

Others did not see the cut down of the budget as drastic. The research in Green ICT and Materials platforms continued almost as the same as in 2012. In Green ICT one project had to be ended and in Materials all the projects continued onwards. Only the expansion of the platforms and integrating new projects to them was completely ended. The professors among Green ICT were not overly concerned about the shorter budget, since they could still continue their research with the smaller scale MSc Thesis research projects. The professors in Materials team on the other hand were very disappointed that they still could not hire enough full time Post-doctoral researcher and Doctoral Thesis workers to conduct the research, which their projects would have required.

"I recall that after the funding was cut we did less of these new things, and focused on the topics we had already chosen."

Head of Green ICT platform

"If we want to start conducting a research and hire doctoral students and post-docs, for example, we certainly have to be able to hire them for a period longer than half a year."

Head of Materials platform

The sudden cut down of the budget was a surprise to many of ESCI's professors, who were in the belief of ESCI's 3+2 years of funding and a substantial, competition free funding of their projects. The promise was given rather inside ESCI's first meetings in 2011 than from the dean or Aalto management, which was giving money to the SCI's budget annually in "*Resource Dialog*" negotiations. The cut down of the budget made the ESCI professors also aware that ESCI's recourses were not going to be as certain as many imagined. Nevertheless, the research platforms continued with the research projects. For example Green ICT team continued their work with AEF's funding application and applied for the second application round in the end of the year. They didn't make major changes to the application structure or project plans of the first application, but focused on refining it to better match the application criteria. Along with Green ICT, the Materials team, whose budget stayed nearly unchangeable, could progress with their previously planned projects. Materials team held a kick-off seminar for their projects in November. Energy Markets did not start of quickly enough so it was shortened to cover a single project but yet to make use out of the network that was build around it. For example by finding leverage for ESCI's funding though the connections that Energy Markets platform's members had.

Before the deans funding decisions ESCI planned to continue with only the three platforms Green ICT, Materials and Energy Markets if its primary or the secondary funding proposal of 1,2 or 1 million € was not accept. Due to the more dramatic cut down in their budgets as ESCI's board expected, ESCI decreased the slowly progressed Energy Markets into a single project which released funds to Nanoplasmonics research area, which ESCI carried forwards as well as a single project. Nanoplasmonics project did not focus on the research of professor Päivi Törmä, who elaborated the original Nanoplasmonics research plan, but on ESCI's board member Jukka Tulkki's research on nanoplasmonic phenomenon in LED applications.

ESCI's research activities fully started in the beginning of 2013. The shorter budget meant that the research could not be fully executed as was planned, but at the same time it forced find a clearer focus. Finding the focus also brought up major differences between ESCI's platforms in the approach to conducting the research.

3.4.2 Emerging differences between thematic areas

The Green ICT's second application to AEF that was elaborated in November 2012 was also rejected in the beginning of the year. After the unfortunate news, Green ICT focused on three research topics that it explored by conducting MSc theses and one Doctoral thesis. The topics were: Electric car's energy efficiency, distributed computing systems and museum digitalization. As well as other research teams in ESCI also the professors in Green ICT platform wished to hire Doctoral students to conduct the research, but with the smaller budget they hired mainly Masters Thesis students. Only for the project about museum digitalization Green ICT hired a Doctoral student in 2013. The Green ICT platform opted to hire several MSc students with whom the research had relatively low level of academic impact, rather than narrow down the thematic area to for example a single project with hired PhD students or Post-doctoral researchers.

The level of academic impact and the spectrum of research areas were in fact quite the opposite in Green ICT compared to the other thematic platform, Materials. While in Green ICT the thematic subject of energy efficiency of ICT networks was explored broadly from societal, business, theoretical and technical viewpoints but academically only 'scratching the surface' of each topic, in Materials platform the research focused on pursuing the scientific development of methodology of the thematic subject of corrosion of metals in extreme conditions. The budget cut only increased the contrast, when Green ICT continued researching various topics but with low resources and Materials specialized their research area even further.

In Materials platform, the members believed high-impact research that could be acquired only with a large funding base or, when the funds are short, by focusing down to a single topic.

"When doing scientific research there is always the point that if the amount of money is, say, a few hundred thousand per year, then maybe it all should be allocated to a single project."

Leader of the Materials platform

The research in Materials platform's projects aimed primarily to reach a level where it could result in academic publication in a high-valued journal, as opposed to exploring the potential of the topics as the project in Green ICT focused on.

Both of the platforms had members from many different disciplines, especially Materials which had collaborating professors from 7 schools or universities. Nevertheless, their approach to multidisciplinarity differed as well, along side with the scale of research. In Materials the researchers from different disciplines contributed with their knowledge to solving problems of a single topic. In contrast in Green ICT, the different disciplines were not only working together to solve many different problems, but also finding new ones. The leader of Energy Markets project, which was later merged to Green ICT platform, was also shared Green ICT's mindset towards multidisciplinarity.

"Certainly a very big role for multi- disciplinary thinking is that of identifying new problems. Which are not even necessarily perceived as being such yet, but which will be on the horizon in the years to come."

Leader of Energy Markets project

The different nature of their research, in Materials highly scientific and in Green ICT more applied oriented, explains the different approach to multidisciplinarity. Framing of the research projects in Materials platform was such that without the specific knowledge of subject collaboration would have being difficult. The extensive approach to Green ICT's topic on the other hand, made it possible for its members to form collaborations from disciplines far apart. The difference in the specialization reflected also to the need for funding, and thus the cut down of the budget was more affecting for the Material platform's research. The interviewed members of the Materials team furthermore expressed the disappointment of the budget cut more clearly than that of the interviewees of Green ICT platform.

The Nanoplasmonics research project was similar to the Materials platforms' research projects in the way that it too was highly specialized in its narrow topic, which covered nanoplasmonic reactions in LEDs. During 2013 in Nanoplasmonics held one seminar for 24 people about the subject and published two papers in international journal, but participated inactively in ESCI's other activities. One member of ESCI's management board described the research in Nanoplasmonics to be the most difficult to be integrated with other ESCI's operations, despite the project leader's strong will to bring it part of ESCI. According to the management board member the leader of Nanoplasmonics project mostly reported in about the progress in Nanoplasmonics project rather than collaborating with other members.

Energy Markets, another smaller scale project in ESCI, focused on modeling renewable energy's affect on energy price volatility in energy networks. During the spring 2013 a Finnish energy company Fortum was discussing about cooperation with the project but despite promising negotiations with Fortum representative and the head of ESCI the cooperation did not begin. The project nevertheless progressed and through ESCI Energy Markets hired one part-time researcher and conducted on MSc thesis. Because the same topic received also funding from AEF as it was part of AEF project STEEM, some of the activates such as writing a paper to an international journal was conducted through AEF. Likewise Nanoplasmonics Energy Markets was somewhat distant from the other research and researchers in ESCI, even though in 2012 it was still being planned to be, similar to Green ICT and Materials, a collaboration platform inside ESCI.

3.4.3 Progress in education and student involvement

With the dean's encouragement from the previous autumn's budget negotiations to proceed with ESCI's plans for education, the ESCI members outlined the Minor Programme, Multidisciplinary Energy Minor Studies during the spring 2013. As the programme was in its initial plans from 2012 merely ESCI's contribution to of SCI's and Aalto's strategy to develop the education through strategic initiatives, and not much emphasis was placed on it in the beginning. The leader of ESCI also agreed in his interview that in the beginning the ambitions for education were low, when he recapitulated the events in the beginning of ESCI's operation

"Teaching was clearly a goal emerging toward 2015 (at the level of the Aalto University as a whole). So it didn't exist in the beginning (when ESCI was established) but would begin only later on. – To me, it seemed more like a goal forced on us. Having to be there, rather than seeing it (teaching in relation to ESCI) as a strategic opportunity."

Director of ESCI

The dean's clear indication for his support towards ESCI's education plans started the planning of the programme in the beginning of 2013. Altogether eight professors from ESCI and one professors from BIZ school formed together an outline for multidisciplinary minor programme that consisted from a set of existing courses of the professors as well as two new commonly planned courses. The new courses were "*Multi-disciplinary energy perspectives*" and "*Special Course on Energy Efficiency of Mobile Devices*". The intention of the course mix was to provide the students, not only subject specific knowledge, but also integrative understanding across the energy study field. The courses were looking at energy from different angles: from points of view of theoretical science, business, economics, engineering, human behavior and social science. From these angles the course dressed subjects such as Sustainable Energy, Green ICT, Energy Markets, Green Business, Smart Power and E-Mobility, essentially the same subjects as ESCI was conducting research.

The professors confirmed configuration of the courses during the spring and it was adjusted still in ESCI's board meeting in June. In the meeting the some of board members expressed critical opinions towards the multidisciplinarity of the progreamme. One of the teaching professors in the minor programme was concerned that energy science students will graduate as 'general experts' who has little knowledge about energy technology, if the programme is an alternative next to another energy minor programmes. The critical discussions raised question of the minor programme's identity: 'What the students have to know after the minor?'; 'What do the students learn here?' and 'What is the novelty this minor drives to?'. The meeting did not yet conclude answers to the questions, but later on in 2013 ESCI's professors refined the final form of the programme. It formed a three level structure, where the students first were given introduction to energy's

multidisciplinary issues, then introductions to specific perspectives and finally deepening their understanding in their selected perspective. The programme with its three level structure began in the spring semester 2014.

Besides that ESCI formed its education activities, the plans for participating students to ESCI's activities also progressed during the first half of 2013. The initial plan in 2012 was to establish a space where students, researchers and companies from the energy field would come together and which would enhance energy innovations and support forming start-up companies. The task to formulate a concept of the space called Energy Garage 1.0 was given to a student team from a Master's level innovation management course Innovation in Action. The leader of ESCI as well as one other ESCI's board member and a researcher in ESCI, who later became the Development Manger of SCI and part of the dean's office personnel, were also part of the concept creation process and represented ESCI in the first meetings and a workshop that was organized by the student team. Their concept of Energy Garage was presented to ESCI in the summer 2013, but still at that time people, recourses and a space were missing from carrying it out. The Energy Garage 1.0 concept and the subsequent development of Energy Garage will be discussed in detail from the Section 4.5.1 onwards.

3.4.4 ESCI's identity and plans for 2014

The functioning form of ESCI's research operations were also crystalizing during the first half of 2013. In June ESCI's board meeting the board members summarized the progress so far. They concluded that the research activity in the platforms and projects had started well of. The projects had found their focus and there did not seem to be difficulties using the budget, as was the case in 2012. The board-meeting memo showed the board confidence that the well-started activities would be valued also by the dean in the autumn's budget negotiations.

Although, the uncertainty of ESCI's funding had increased during the summer, since SCI had appointed a new dean for the position to take over the task from the temporary second dean of SCI. Besides with the new dean, a new executive assistant and a new development manager were assigned to their position, therefore the dean's office was starting their work afresh. The dean with SCI's new management personnel, could begin to take SCI to their direction without the atmosphere of

temporality, which influenced the management term of the previous dean. For ESCI, this situation created uncertainty as the new dean wanted clarification to the reasoning why ESCI's work was valuable and worth being supported by SCI. The central argument to support ESCI's coming proposal to significantly increase its funding was the schools internal cohesion that Aalto wide AEF projects were lacking. According to the board's conclusions, ESCI was need to guarantee the school's in-house scientific content of the energy research and to reach the full significance of ESCI's research so far. ESCI's board wanted to make clear difference between AEF and ESCI. ESCI was a well coordinated and its well-organized management made sure that the results are compelling. According to them, in contrast, AEF was non-transparent organization where its selected single projects are all outside of what ESCI was doing. ESCI was science-based and AEF was non-science-based, stated their conclusions of the board meeting. ESCI's ambitions went further than purely publishing top research papers, it was 'beyond the state of the art' as was described by an interviewed ESCI's board member.

"Peter highlighted that we should enjoy and have fun, and the research and everything we do should be very ambitious. He used the term 'beyond the state of the art'."

ESCI board member

ESCI hoped that the third dean of SCI would have the will to increase ESCI volume, when originally the previous dean supported ESCI proposal 1 million € funding before the University's management decreased SCI's overall strategic funding. ESCI got its change to present its arguments for increasing its support from the schools strategic budget, when one of the ESCI's board active members held a presentation in SCI's management board meeting in October. He presented ESCI's results so far, plans for 2014 and proposed a 500,000€ budget for 2014. The presentation was well planned and also the positive reactions and support from the management board after the presentation suggested that ESCI's work was valued in SCI. Thus it was largely overwhelming for the board member who represented ESCI in the meeting to hear the dean's proposal to cut down ESCI's budget even lower to 60,000€ for the coming year.

The deans suggestions to grant ESCI the 60,000€ was somewhat a concession towards ESCI since he and the previous dean of SCI had discussed about how ESCI were supposed to be developed and one scenario was to completely cut off the funding. The new dean was compering ESCI to AEF, where he had being board member before coming the dean, and did not initially see the value of the school's own ESCI program being next to a much larger Aalto wide multidisciplinary energy initiative AEF.

"The volume was probably the question that occupied my mind, as was the added value (of the initiative). What do we (SCI) get from this, if the same people are involved in AEF and ESCI?"

The third dean of SCI (2013-)

To recover from the ESCI's changed situation, its leader contacted the dean and presented his thoughts about the effects of the dean's suggestion and convinced the dean to reconsider his plans to seriously cut down ESCI's funding. When the new dean's lack of long term support for ESCI's research activities became apparent for its leader, he suggested moving its focus away from the research and shift towards students and education.

"We began to think that -- if the school does not see value in (ESCI's) research, what would generate the added value that is possible to such multidisciplinary collaboration across department boundaries? And we arrived at the conclusion that education and the students are just that. Energy Garage is the thing that generates the added value to Aalto's investment."

Leader of ESCI

The dean was content with the suggestion, and was especially interested in Energy Garage, which idea was in more detail introduced to him by SCI's new development manager, who had previously being a member of ESCI and actively taken part in Energy Garage's development, for example in the Energy Garage 1.0 concept.

In the beginning of 2014, ESCI was eventually granted with 200,000€ funding and a distribution of 100,000€ surplus from 2013. It guaranteed ESCI's projects resources

to finish their projects in the coming year, since on that current situation it seemed that ESCI with its research operations were not receiving more funding after the first three operation years.

Nevertheless, before the direction of ESCI's future was certain, the leader of ESCI stressed in his email to his board members concerning the plans for 2014, how important it was still to make detailed plans for the coming operation that would clearly show the genuine new cooperation, multidisciplinarity and added value ESCI was bringing. Also during the ongoing year he wanted to be more punctual in following the research projects' and platforms' fund spending and make sure ESCI would avoid surplus in its budget, which SCI's management had earlier criticized. Project's leftover funds were ought to be re-allocated to other projects. In his email, he also suggested to considering other funding options to continue ESCI's activities after, as was excepted, SCI funding would end. Even before the Energy Garage idea was introduced to the dean, he had recommended to move ESCI more towards the multidisciplinary education that was successfully launched earlier in 2013, and continue the project for example in AEF.

Later in January, the dean eventually expressed his full interested and support for running up the Energy Garage project. Consequently over 60,000€ of the total budget was assigned to ramp up Energy Garage in the spring and summer 2014. The support for Energy Garage was not only given for the coming year but for five years onwards. Also additional rounds were planned the Multidisciplinary Energy Minor programme with the network of ten professors and three schools that was then organizing it. The shift orientation shift towards students and education meant an end for ESCI's research projects, which were due to be wrapped in ESCI Wrap-up Seminar at the end of 2014. The new direction was not seen as the end of ESCI but rather as a 'Phase II' in ESCI's history, as ESCI's board meeting memos referred it.

3.4.5 Summary

During 2013 and 2014 ESCI adapted to the its shorter than planned budgets by changing their operation. Based on the empirical data the study finds that the adaptation to the cut budget occurred in two development steps, which both took ESCI to a direction that were positive outcomes to some but failures to others.

Firstly, starting from the beginning of 2013, ESCI decreasing the scope of its research activities as well as conducted research with lower expenses. Many of its projects were explored with Master's Theses and abstained themselves from hiring researchers to the projects teams. The policy of not recruiting Doctoral students was seen as a necessity since it would have required at least guaranteed four years of funding for the projects. The researchers from Green ICT could continue their research almost as was planned, with the exception of not being able to recruit researchers or continue expanding the scope. They were also the most content with the research results in ESCI and saw them as very encouraging in considering further research of the field. On the other hand, the contentment, as well as scope and aim of the research, differentiated inside ESCI and created a clear distinction between two research groups. The research in Green ICT and Energy Markets conducted research in projects that explored the thematic topic with wide scope but also with shallow academic impact, since the research was conducted with Master's thesis work. In Materials platform the research focused narrowly on methodology development of their specific thematic area and in Nanoplasmonics on theoretical model building. The researchers in especially in the Materials platform were more dissatisfied for the results and the impact their ESCI research generated.

The second development step was the orientation shift towards students and education, through the student driven innovation space, Energy Garage. This development direction was largely encouraged by the two deans who led SCI during 2013 and 2014. The orientation shift was welcomed by some members of ESCI, while to others it was more or less another disappointment or even indifferent. In retrospective, for instance the leader of ESCI considered the emergence of Energy Garage on ESCI's research expense a positive new opportunity even to create societal influence through this student driven activity. On the opposite, the board members from Materials platform thought nothing much of the new student innovation space. To them, ESCI lost most of its significance in the budget cuts. The third dean of SCI, who eventually decided upon ESCI's orientation shift, did not see the value of ESCI's research, but rather considered it inferior in comparison to the Aalto wide energy program AEF. Although, his previous position in the management board of AEF increased the subjectivity of his viewpoint. To him, as well as for the leader of ESCI, a greater added value could be achieved with the Energy Garage that

had successfully being conceptualized during 2013. The dean saw ESCI's research being too close to or overlapping the research projects in AEF, and the focus on students on the other hand an emphasis that AEF was missing.

When the ESCI's research projects were brought to conclusion at the end of 2014 and the Energy Garage started its operation in September, it meant of complete change in ESCI direction from ambitious, multidisciplinary energy research initiative to student driven organization operating a energy innovation space.

3.5 Orientation shift towards students

Whereas research activities in ESCI faced cutbacks and were finally ended in 2014, work towards student involvement in ESCI started to take major steps already at the end of 2012 and in 2013. What started as a relatively unimportant goal in ESCI's early plans, turned into an important focal area for redirecting ESCI in 2014 toward the Energy Garage student platform.

3.5.1 Initial planning of Energy Garage

In the end of 2012 the dean of SCI granted a radically smaller budget to ESCI compared to what it proposed and to what basis ESCI's ambitious plans were built upon. The cut in ESCI's budget meant an ending to its research plans and the build up of an internationally know Energy Center and reduction to its activities. It also made the leader of ESCI reconsider the value that ESCI brought in a large Aalto context. In his opinion, even with smaller budget ESCI's multidisciplinary and cross department cooperation could have a significant impact on education and students.

The idea to emphasize students and education was also echoed by the dean. According to him, instead of funding specific research projects to which ESCI would be just another funding element it is more meaningful to support larger systemic issues such as student driven activities and education. In ESCI's board the student participation was especially supported by one member of ESCI's board, who had actively presented his ideas of multidisciplinary meeting point of students, researchers and companies along the year 2012. The supporter of the idea to concentrate more on students got also one of his researchers along with the idea and together they and the leader of ESCI reached for students to participate in ESCI's activities in the beginning of 2013.

They gave a task to a student team in Masters' level innovation course, *Innovation in Action*, to design and test a students energy related collaboration space called "*Energy Garage 1.0*": 'How to create an inspiring and interactive space where students and researchers collide in energy to create new innovations'

During spring 2013 the students identified a space for Energy Garage in an old Machine Engineering laboratory and formalized a concept of Energy Garage. According to the student team, Energy Garage should be an easily approachable lobby-like space that would attract new users and encourage them for informal interaction between each other, where they could conduct small experiments and build prototypes and work in environment favorable for learning. The team especially underlined that the space should support student driven activities that goes beyond the average university courses' content. In addition to crating the concept, it was also introduced to some of Aalto's student guilds and to four Finnish companies by the team, who all showed tentative interest towards Energy Garage if it were build. Later, the students' and the companies' interest towards Energy Garage proved to be important indicators for ESCI to carry out the project.

Their concept of Energy Garage was published in an end report of the team in the summer 2013. The concept was warmly welcomed in ESCI, to the extent that the leader of ESCI wished that the students would even continue with their work and carry out the concept completion. Nevertheless, due to internal conflict in the student team did not want to be part of Energy Garage anymore after the course in summer 2013 and the Energy Garage concept was pushed to the background for a while. Also, there still remained a questions concerning of a space that the student identified to be suitable for Energy Garage. To begin building up Energy Garage ESCI would have to find funding for the rent as well as seed funding to renovate the space, which still was an old laboratory storage space.

3.5.2 Realization of Energy Garage concept

After a half of year of inactivity the Energy Garage plans were taken forwards in the end of 2013, again with the push from a budget that was a substantially shorter than ESCI proposed. Instead of focusing fully on its three established platforms, which was ESCI's initial plan if it did not receive the proposed funding from SCI, from the dean's suggestion ESCI shifted its orientation towards students and education.

The new dean, who was appointed to his position in July 2013, decided to grant ESCI 60% of the 500,000 € funding that ESCI proposed after already considering to end the initiative's funding completely. To his point of view, ESCI was excessively overlapping Aalto's own energy initiative AEF's agenda. Before his appointment to SC's dean, he served in the board of AEF and thus knew its principals and projects well, in some of which few ESCI's professors were also part of. In addition, after the change in Aalto's funding policy in 2013 the schools were obliged to fund Aalto's joint units such as AEF, which made the dean careful in allocating the school's scarce strategic budget to initiatives with similar agendas but considerably smaller size than Aalto's own programs. To the dean, ESCI was 'subcritical' in order to create impact that cold not be achieved in AEF program.

"In a sense, to me ESCI was subcritical. A little money was allocated to it, with good results, but the impact was not sufficient."

Dean of SCI (2013-)

Nevertheless, after discussion with the leader of ESCI and The development manager of SCI, who was newly appointed to her position after being ESCI's contact person in the students Energy Garage 1.0 project, the dean understood the value students could bring through their activity in ESCI's Energy Garage. As he described, he and the leader of ESCI made a decision together that SCI would end ESCI's research activities and the funding would be directed directly to the students through Energy Garage space. The decision was influenced by encouraging results from Aalto's other education spaces, called Factories, that were based on student driven activities. In Aalto, the Factories had already become a trend. The trend was started and led by a collaborative education and innovation space Design Factory. It was established in 2006 and by the time when Energy Garage was planned in ESCI, there were already five different factories in Aalto, all specified to certain topic with the same student driven orientation.

To ESCI's leader and its members who participated in the planning of student activities in ESCI, Aalto's factories were partly inspiration for Energy Garage, but partly already and institutionalized organizations. For the dean, they, especially Design Factory, was a proof of that the chosen direction to focus on students in ESCI was promising. He wanted SCI to have its own space for its students.

"Think Design Factory in particular, where they had created an inspiring milieu with the idea of students first, where they could work with all sort of things. -- We wanted that there would also be a space like that (in SCI). Which the students would take as their own, where they would have some money at their disposal, they could do their own things and create a kind of meeting place."

Dean of SCI (2013-)

3.5.3 Establishing Energy Garage

In the end of January 2014, the head of ESCI board updated ESCI's budget for the year that was created earlier that month. The dean had given his final support on Energy Garage and wished that it would be built up during the first half of the year. ESCI re-allocated its budget and placed 62,000 € for Energy Garage's build-up costs and began to assemble a team to plan and build the space.

The aim was establish a student-driven innovation space for students interested in energy to run their projects, student organizations their perform activities and to draw private companies to partner with the students in collaborative work. As the student team from the course Innovation in Action also suggested in their Energy Garage 1.0 concept report, the actual implementation of the aim was left for its user, the students. Energy Garage wanted to be based on the same bottom-up approach as ESCI was. In Energy Garage's case it meant that The space would be designed by its users and, when it will be in use, the activities inside the space would defined by them as well.

To reach the potential Energy Garage users, ESCI's leader contacted student organizations, and gathered a group of six students from three student guilds to plan, design and build the space. The team members came from guilds Lämpövoimakerho; Physics Guild, Prodeko Guild, which members would potentially be interested in Energy Garage activities. The team got strong support from various SCI and Aalto administrators and personnel, who ESCI's leader and The development manager of SCI gathered around the Energy Garage project. An interior designer from Aalto Library Services created the design concept of the space, while SCI facility and technology manager obtained a permit for ESCI to use the found space in the School

of Engineering premises. Also SCI's Corporate Relations Manager was helping with establishing Energy Garage's corporate relations in accordance with Aalto's guidelines, and later in the building phase of the Energy Garage in the summer a campus manager from Aalto's Campus Services organized and supervised the renovation process of the Energy Garage space, which still in the May was an old laboratory storage. ESCI also hired a project manager, a Energy Engineering student, to manage the Energy Garage build up project as well as later on coordinate the ready space. He started in his work during the spring when ESCI was being planned.

Despite that ESCI's leader and The development manager of SCI closely followed the planning and build up process of Energy Garage, purposefully the 'authorities' such as ESCI's leader or its professors were left aside in order give the users, the students, a free hand to shape the Energy Garage to meet their preferences. During the planning phase in the spring and build up phase during the summer months in 2014 occurred high excitement and commitment between all the building project participants towards their work. The interviewers who participated or followed how Energy Garage was build up described the atmosphere to be something extraordinary that the students' and SCI and Aalto personnel's jointly implemented project created around it.

> *"I have rarely seen this kind of positive intent, that everyone has a shared sense of direction in Finnish projects. -- And what has been quite extraordinary, there has not been any conflicts (between the participants) during this project, no one who wanted to curb this."*
>
> Leader of ESCI

Also the dean of SCI was convinced of the students' excitement during the planning. In his interview he describe how one lunch meeting with SCI's student guild chairmen, who were part of Energy Garage planning team, was a strong signal to believe in student initiated activities in the university.

> *"And they brought it up, saying: 'This was the best thing that had happened to them over their studenthood , so thank you for giving us this space. We are very satisfied and we will start building this together' -- It was a strong signal and a positive experience. It got*

me thinking that there is this unused latent potential that we have not been able to take advantage of."

Dean of SCI (2013-)

The positive ambiance around the project also carried out to an end result that not only satisfied but also surprised the project participants and ESCI management. The budget was unusually small for a project budget like Energy Garage build up, as the campus manager who coordinated the actual building noted, but even that was not all used. In the building a principle, "The more ragged, the better", as one ESCI board member put it, was applied. The space was left ready for later modifications, when the build-up project was ended and Energy Garage opening ceremony was held in September 2014. In the event, the dean of SCI assured of his support for the new direction of ESCI, for which he had already promised at least a five years of SCI's funding. Also the president of Aalto attended the ceremony, indication with her presence the support for Energy Garage also from Aalto's management.

Operation phase of Energy Garage

At the same time when this study was conducted in autumn 2014 and spring 2015, Energy Garage was finding its way and shaping its form. At the beginning of its operation it was a space for variety of events, such as Aalto University's internal energy seminar, student union meetings and lectures of varying courses, as well as keeping its doors open for anyone to use as a studying or for small energy related projects. No performance indicators were set to define if the use of Energy Garage had being successful, but as many interviewees pointed out, the utilization of the space was disappointingly low. Some even doubted if the school will fund Energy Garage much more longer, since over the time its added value will not overcome its high rent that is paid from the school budget.

Until the beginning of 2015 the management of Energy Garage was mainly in the hands of the Energy Garage project manager who was in close contact and responsible for the leader of ESCI. Student unions had being also partly in control of the space but now ESCI's leader wished them to take more responsibility over the utilization and content creation in Energy Garage. Therefore Energy Garage Board was established in February 2015, which consisted of student union representatives

from Industrial Engineering and Management guild Prodeko, from the Guild of Physics, from Energy Engineering club LVK, from the Guild of Civil Engineers and from the Computer Science Guild as well as two professors from ESCI, ESCI's leader The development manager of SCI, SCI' Corporate Relations Manager and Energy Garage project manger. ESCI's leader, who was leading the board, hoped to active the students to utilize the space though the formal structure of the board. Energy Garage, which was planned to grow from inside from its users by supporting the space with rent, tools and funding, seemed to require more guidance from the authorities.

3.5.4 Summary

The dean, prevailed organizational environment as well as individual activity all had an influence in shifting ESCI's orientation towards building up and running the student driven Energy Garage space. The data suggests these were in essence the three main factors that guided ESCI to the direction of Energy Garage.

The third dean of SCI was assigned to his position in the summer 2013. He had previously being a member of AEF management board and to him, and he urged ESCI to shift orientation towards education and students that, according to him, was lacking from the AEF program. Energy Garage's student made concept and the excitement of the students convicted the dean as well as ESCI's leader and some of its professors to run-up the Energy Garage project in 2014.

On the other hand, Energy Garage could also being seen just as a continuation of the 'factory trend' that prevailed in Aalto. After the Design Factory, many other factories and garages had being emerging in Aalto. The dean himself also admitted that Energy Garage would be SCI's own 'design factory'.

On the background of Energy Garage project was the strong influence of individuals in ESCI board. A professors from the Department of Industrial Engineering and Management as well has a researcher in his team, who in 2013 became the development manager of SCI, were both very active in promoting and advancing the Energy Garage planning. In addition to the leader of ESCI, they were also almost the only persons from ESCI who continued working with Energy Garage after ESCI was officially closed in 2014.

3.6 ESCI outcomes and participant opinions

During its operation time between 2012 and 2014 ESCI did not reach the high goals that the ESCI board set to the energy initiative. Nevertheless, despite the orientation change and the disappointments towards the ESCI's budget cuts and the unredeemed expectations the board the to ESCI, it was able to deliver results that were very satisfying, at least for part of its members.

> *"I would say that for that amount of money (around 200 000 annually), we have been pretty effective in delivering results – And one observation is that in the end it is not about the money the way we tend to think, but it has a lot to do with will."*
>
> Leader of ESCI

3.6.1 Research outcomes

Research was the prime focus of ESCI, with around 80% of the funding and by far the most man-hours put on it. Nevertheless, as mentioned in he previous subsection, the outcomes of the research were biased. In comparison with the goals set and the scale of research that was planned, the outcomes were slightly a disappointment to many. Altogether 12 papers were published, 20 MSc Theses and 7 seminars or conferences were held. The sought high international publicity of those papers was not reached either. On the other hand, ESCI's budget was being cut to one fifth of the volume its goals were reflected to. Compared to the limited resources many new research areas were explored which showed promising results.

The four platforms delivered different kinds results, mostly because of the largely different budgets, but also because of the different focus of them. In Green ICT most of the ESCI's papers and MSc These were written, due to the international and experimental nature of the their research. In Materials, on the other hand, the amount of papers was smaller but more papers than MSc Theses was published. Also their research is applied to be continuing in European Commission Horizon2020 project with very similar research focus. The two smaller platforms, Nanoplasmonics and Energy Markets did not publish many articles of MSc Theses, but for example the

research of Jukka Tulkki from Nanoplasmonics in continuing in AEF project MOPPI.

	Publications	MSc/BSc Theses	Seminars	Research type
GREEN ICT	8	16	5	Multidisciplinary and experimental
MATERIALS	4	2	1	Focused and goal-oriented methodology development
NANOPLASMONICS	(6) With other projects	1	1	Research in other programs, reporting to ESCI
ENERGY MARKETS	2	1	2	Small scale collaborative and networking

Green ICT

The allowing and everywhere expanding research ended up cumulating 16 MSc Theses, 8 publications, 4 internal and 1 external seminar. In 2012 in the beginning of Green ICT's operation the focus of the research was not clear, thus altogether four directions were tried with MSc theses and only some directions led to publications. The publications addressed subjects of energy consumption of ICT systems in a broad sense, electric cars, smart homes and art installations exploring social behavior and energy consumption. Naturally the type of research in these projects was different. Some were highly technical such as an article in preparation called "*Increased PV self-consumption and optimal electricity consumption with DSM and thermal and electrical storage in a smart house*", some more multidisciplinary such as "*Digitization Experiments using a scanning robot with the Gallen-Kallela Museum*", and to thoroughly social artistry, such as "*Light is History: A Community Participated Museum Installation in Helsinki Finland*".

The article addressing smart home PV application was part of research project conducted in cooperation with startup company from the field and between professors Kary Främling from CSE, Peter Lund and doctoral candiadate Jyri Salpakari from PHYCIS. The study was researching the measuring of real time electricity consumption and the exact temperatures from varying points of a

residential apartment and thus optimizing the heating of the space. The project was a good example how the projects in Green ICT ended when they met a dead end. Funds of the startup ended and the project could never be finished.

The multidisciplinarity in some Green ICT's project was probably most clearly shown in the project conducted between CSE's researcher James Reilly and Media Labs Lab's professor Lily Diaz-Kommonen and researcher Samir Bhowmik about the use of scanning robot in digitization of Gallen-Kallela Museum's recorded files. For the researchers it was ground breaking to combine two different perspectives and write a paper together. When Jamed Reilly was interested in the technical aspects staring from image quality to texture of the paper, professor Diaz-Kommonen and Samir Bhowmik looked the aspect of what is the social value of physical items, when they could be digitized, and would I save energy to do so.

The members of Green ICT platforms used significant amount of time in cross-disciplinary meetings in the first phase of its operation. Only to find a common language between the researchers of different disciplines was seen challenging and the team had several meetings where they only ideated and discussed about the potential projects. The challenges; vague focus in the beginning and the difficulties of multidisciplinary collaboration; were answered with relatively large amount of MSc thesis compared to published papers. Half as many published as Theses were written.

Despite the collaboration was seen slightly challenging, the biggest value of ESCI to the Green ICT team members came from meeting new people and the expansion of the viewpoint that the collaboration gave to them. All the members of Green ICT as well as many other informants who were interviewed agreed on this.

Green ICT and ESCI in general did not only create added value through direct research outcomes in the form of published papers and conducted Master's theses but also generated leverage for other funding sources to energy research in SCI. In Green ICT, the leverage funding primarily meant a funding from Academy of Finland project "*eMo - Energy-Optimized Mobile*" and a funding from European Commission's 7th Framework Program project "*CIVIS - Cities as drivers of social change*". In addition to these sources that funded project related to research projects in Green ICT platform, the professors from the platform applied funding from

several other funding sources such as Tekes and AEF, which eventually rejected Green ICT's application.

Materials

When the research in Green ICT took time to settle on its tracks, the research focus and direction was quickly chosen within the Materials team. With the lead of professor Tuomisto, the focus was narrowed down to one topic: oxidation-based corrosion of monoatomic metals and alloys in nuclear reactors, where the harsh environment includes high temperatures and strong radiation. In the first year of ESCI's and Materials team's operation the aim was to quickly hire four to five full-time researchers to study the topic. Despite their quick reaction and immediately calling for doctoral thesis worker, it took almost a year to hire him, and by that time it was already clear that the shortened funding from ESCI was not going to be enough to hire more. The difficult funding situation meant for the Materials team that the selected topic was being researched with the resources they had but it was not going to expanded any further.

The narrower topic also made the research more difficult to find interconnections with other disciplines outside the physical science boarders. Thus, the research was less interdisciplinary compared to for example the research conducted in Green ICT platform, despite many more researchers from various departments were involved.

From Materials platform altogether four academic papers and two MSc theses were published as well as one, "Materials in extreme conditions", external seminar was held. Although short in numbers, the publications were aiming to reach high international level, which required the strict focus of the topic. The papers the theory as well as experimental methodology of studying the oxidation process that was in their scope. Theory creation was about the potential of Molecular Dynamics simulation of copper oxides. The research was joint collaboration between professors Ala-Nissilä from PHYSIC, Laasonen from Department of Chemistry and Jonsson from University of Reykjavik, who was a visiting professor at PHYSICS through FIDIPRO visiting programme of the Academy of Finland. A methodology development research on the same subject focused on developing a set-up for doing

stress-corrosion cracking experiments. As an outcome of the project a fully digital gamma-ray detection system was developed.

Even though the members of Materials team felt that the impact of the research did not reach its full potential due to restricted funding, the research is hoped to continue in a European Commission's Horizon2020 program in a project with a title: "*Development of improved materials for severe operating conditions, including added-value functionalities e.g. self-diagnosis, self-healing*". The program would guarantee the steady funding that ESCI could not offer. In addition to this, professor Ala-Nissilä's research on nanoparticle-fluids in heat transfer application was selected, which was initially planned to be taken part of Materials platform, was eventually chosen to AEF program.

As well as was for Green ICT's members, the informants from Materials team also emphasized the importance of meeting new people, broadening awareness about the research topics and know-how in SCI and how ESCI helped to establish new collaborations that continue even after ESCI ended.

Nanoplasmonics

The research in Nanoplasmonics project in ESCI stayed on a small scale. Under ESCI one MSc thesis was written and one seminar was held. The research that in Nanoplasmonics teams was conducted concerned the numerical implementations of fluctuational electrodynamics, which implementations relate to the energy absorption and emitting of LEDs. The work in ESCI was minor, but especially the leader of the project Jukka Tulkki linked the research strongly to other projects. He was particular active participating an AEF project MOPPI, where the research still continues. In addition two projects from the same plasmonic research field was chosen to Finnish Academy's New Energy –program, from which both were also part of Nanoplasmonics research plan before ESCI's budget and research activities were cut.

Energy Markets

In the beginning of ESCI, the goals for the research of Energy Markets platform were set high and with the lead of Ahti Salo, who well connected inside Aalto as well as internationally, various directions for the research was identified with Energy Markets team. Altogether five large subprojects were planned to be started, with an

over 200,000€ annual budget and a research group of six main researchers. The subjects were: *Dynamic portfolio model*, *Large energy investments*, *Product differentiation*, *Supply and demand flexibility* and *Energy system dynamics*. In the end, only two of those subprojects were briefly explored until the whole Energy Markets platform was integrated to Green ICT.

The first of the article, "*Does renewable energy generation decrease the volatility of electricity prices? A comparative analysis of Denmark and Germany*", discussed the variability of energy prices in Denmark and Germany and introduced a time series analysis that the research team developed. The team included professor Ahti Salo, Master's student Tuomas Rintamäki and a visiting professor Afzal Siddiqui from UCL London. In the second article, "*Multistage investment under two sources of uncertainty - A real options approach*", professors Salo, Siddiqui and Kauppinen, explored how to model, multiple uncertainties in a multi-stage energy investment. After the Energy Markets was merged with Green ICT platform, a Master's thesis project was conducted that related closely to both of the thematic area's agendas. It studied an optimal routing of electric vehicles in urban environment and received encouraging feedback for continuing the research of the topic.

Despite the small-scale research, Energy Markets made a significant impact with their research and the research topic was chosen to AEF project STEEM, where Tuomas Rintamäki continues the research of electric price volatility. In addition, ASCI funded through its research Visiting Professor program professor Siddiqui's visit and collaboration with the Energy Markets research team.

3.6.2 Reflections on the outcomes

ESCI members' discussion in ESCI Wrap-up Seminar and the responses of the informants in their interviews clearly reflected a distinction in satisfaction for ESCI's general results highlighted between the to main researches platforms. The members of the Green ICT platform were mainly satisfied for their research results that they delivered within their research projects. The permissive spirit towards the research topic ideas that prevailed in the platform resulted in various smaller, experimental projects that were conducted with Master's Theses. The approach supported Green ICT platform's aim to first find most promising directions in energy research before hiring Post-doctoral researchers or Doctoral students. Its members' satisfaction

towards the found potential and established network also reflects the effect of this approach.

> *"I cannot argue that in three years we reached the top research forums. However. I can argue that perhaps we know how we can get there now (thanks to ESCI), but it is not possible in three years. So, we accomplished a lot but I would say that is a good start."*
>
> Leader of Green ICT platform

On the other hand, the initiative members who represented the Materials platform felt that after the ESCI's budget was cut and that SCI's 1 million annual funding was an empty promise ESCI became less significant to them. Research continued within the Materials platform but it was conducted "*completely regardless of the initiative's existence*", as the leader of the initiative described. The network that was formed around Materials platform consisted mainly of professors that had already being collaborating together, although some new collaborations was also formed n the beginning of ESCI's operation. The funding of the platform's projects was also partly covered from other resources. Thus, to the Materials team members, the added value that ESCI brought to them did not exceed the value of the budget ESCI could assign to them. The nature of the highly specified research that was conducted in the Materials platform required direct investments to re recruiting qualified researchers and acquiring laboratory equipment, and thus the value of the network was insignificant if these investments could not be done. The same principle also applied to the research in Nanoplasmonics project, which was as well highly research specified area compared to Green ICT platform or Energy Markets project. However, since it was a comparatively small project from the beginning on and it received funding also from AEF, the leader of the project expressed his satisfaction for even the small monetary and the networking support ESCI could offer to the Nanoplasmonics project.

The dean's of SCI all valued ESCI's educational accomplishments, when they successfully launched the new multidisciplinary energy minor programme, as well as ESCI's efforts in bringing students closer to the center of the focus in SCI with Energy Garage. All of them agreed that ESCI's research was in the end too small

scale to make a significant influence that was a general aim of to SCI's initiatives. Thus, according to them the shift in ESCI's orientation was justified.

> *"I think the Energy Garage is great -- After all, the effectiveness comes through the students, they graduate and go on to influence the society. And that sort of 'hands on –doing' that combines with interesting research topics is the best kind of education, with real impact."*
>
> The dean of SCI (2011-2012)

ESCI's unusual approach compared to 'traditional' research programs of supporting research from the basis of trusting people rather than trusting redelivered results, managing the initiative by its members, from bottom to up, and the pursuit towards genuine multidisciplinarity was also noticed among the deans. For this basis ESCI was essentially established, according to the first dean of SCI. One of the reasons why he decided to establish an initiative around the multidisciplinary energy topic in 2011 was around that topic he found people who were committed strongly for the new initiative. He described the reasons why ESCI was established as follows:

> *"This area of energy was brought up as one of the options. However, maybe one important point was the people who were strongly committed to it. I myself believe in research that stems from the existing, not just deciding top-down that something should be done, but from bottom-up. We need competence and enthusiastic individuals and with them enough know-how and networks."*
>
> The dean of SCI (2011-2012)

The multidisciplinarity aspect was written Aalto's and SCI's strategies and was then emphasized accordingly. To ESCI it was the starting point of its projects but how multidisciplinary was understood varied among ESCI's members. While in Materials team and Nanoplasmonics project the multidisciplinary members focused on specific topics and merely looked at them from different angles, in Green ICT and Energy Markets the multidisciplinary teams started afresh and initiated several new topics that around the wide thematic areas. The multidisciplinary approach of Materials

platform and Nanoplasmonics projects was a concern of both of the dean's who cut ESCI's budget in 2012 and 2013. The third dean of SCI, who decided to shift ESCI's orientation towards the students and education, thought that multidisciplinary remains often only as a superficially added quality into a funding application to acquire funding for initiatives, programs or research projects:

" I have seen quite a lot of the kind of artificial multidisciplinarity. -- Although people come in with a common project, it is often the case that the project has been already divided into multiple separated subprojects in participating people's heads. Unfortunately, too often, 'take the money and run' is the attitude."

Dean of SCI (2013-)

The findings suggest that the research projects in the Materials platform and the Nanoplasmonics project were somewhat more focused to certain specialized knowledge areas, and they were not as multidisciplinary in their orientation than for example the Green ICT platform projects in ESCI. Therefore, some of these projects in the Materials and Nanoplasmonics would have had plentiful opportunities for receiving funding from other, more traditional, funding instruments that typically do not consider multidisciplinarity in the research project's actual content as an important quality. By arguing this, the study means that many traditional funding instruments are characterized as multidisciplinary, but at the level of operationalizing, it is often that the multidisciplinarity is interpreted by looking at the big number of various organizations that the participants come from, and not necessarily the multidisciplinarity of the actual content of the projects in terms of connection disciplines. As discussed by the dean of SCI:

"The Academy (of Finland) would have been a natural target for some LED or solar panel research projects, because they fall often into specific and established disciplines. Or then Tekes, if the research was closer to practical applications."

Dean of SCI (2012-2013)

Neither of the deans admitted directly that their observations had direct on the funding amounts they granted to ESCI, but the fact that ESCI's research activities

were eventually ended was a clear indication form SCI management to some of ESCI's members that ESCI's multidisciplinary research was not valued. When the deans saw research initiative ESCI as an overlapping research-funding instrument to AEF, for example to the leader of Green ICT platform the most important learning from ESCI was that when professors from different departments cooperate and discuss, genuine multidisciplinary results began to emerge. To him this kind of research is not possible anymore since no competitive funding source would support that, it would need another ESCI start the research again.

> *"In my opinion, we saw here that, when professors from different departments representing different disciplines begin to discuss and do something together based on their own and original insights, new multidisciplinary research will begin to emerge. That this type of ESCI –initiative was ended and turned into a student driven Energy Garage, to me, it reflects the conclusion that the university organization does not want to encourage so much this kind of multidisciplinary interaction. In this respect, there's not so much will to support multidisciplinary research across departments. And we do not get funding for this kind of multidisciplinary research from traditional funding organizations because they want to see applications with promises of different kinds of results, with not so much newness. So there is no other funding instrument that would allow for these kinds of results that we got from ESCI. ESCI resulted in the creation of new contacts, and the creation of understanding how we can collaborate. In ESCI we have created an understanding of significantly novel research areas that have not been known or accepted among the institutionalized funding organizations – or in the university organizations or their organizational structure at large. Due to ESCI or corresponding instruments with true multidisciplinarity, we might gradually be able to start applying funding also from those more traditional funding organizations that would typically consider these kinds of new and multidisciplinary research themes too novel and radical,*

and therefore they consider that the applications with such a newness are too vague or shallow. In this way, ESCI has provided a real seed for newness, and therefore it is a pity that the university organization had to reduce the volume of ESCI which leads to reduction of this kind of true multidisciplinary collaboration which cannot really be substituted by other mechanisms."

Leader of Green ICT platform

3.6.3 Summary

The empirical findings support a finding that despite the ambitious goals of ESCI were not met, a dissenting positivity towards ESCI's varying outcomes prevailed throughout ESCI participants as well as among the deans. To ESCI's professors it was a unique opportunity for conducting research with out-of-ordinary ordinary approach, which despite not reaching its full potential showed promises of impactful results. Then again the deans appreciated ESCI's activities that did not have the potential to be overlapping with other Aalto's programs, and thus Energy Garage and the new Minor Program were most important outcomes from ESCI.

For many of ESCI's participants the difference in the viewpoints on ESCI's value was also the most frustrating aspect of the ESCI's budget cut. In their interviews they emphasized the distance between their and the school management's opinion about ESCI's value. According to the ESCI members, as opposed to the dean's reasoning on ESCI's budget cut, the promising research projects especially in Green ICT platform, could not get funding from other sources. On the other hand, from the empirical data the study made a finding that while ESCI's members felt ESCI funding was a necessity for the multidisciplinary projects in especially in Green ICT platform, the research in Materials platform and in Nanoplasmonics project could have, as well as they partly were, being funded from competitive funding sources. The specified research in Materials platform was adaptable for the demands of competitive funding, while Green ICT's ambiguous research approach could not apply funding that required pre-proven promises of results. The finding supports a conclusion that the deans who cut ESCI's budget did not distinguish the difference between these two approaches and the differing opportunities for external funding. The school management's demand for immediate progress and results after the first

year, would have being more favorable for the research projects in Materials platform than in Green ICT, but as ESCI was evaluated as a whole, ESCI's budget was cut concerned the whole initiative.

4 Discussion

4.1 How ESCI unfolded

The first research question asked: *How did the strategic research initiative ESCI develop during its lifecycle?* The empirical findings draw attention to four distinctive steps on ESCI's development path that answers this question. All of them had a major impact on the course of events.

First, the early phases from planning to the first year of operations was characterized by excited atmosphere and good financial situation. Second, in the end of the first operation year ESCI's budget was unexpectedly cut to one fifth of the original. Third, during the second and third operation year ESCI adapted to the scarce funding situation by decreasing and refocusing its research activities and by shifting its orientation towards students and educating. Fourth, ESCI's research activates were ended after three years of operation but at the same time a so called 'Phase II' begin in the form of student driven innovation space Energy Garage. These steps, the main points of the findings, are further discussed following sub-sections.

Findings from the ramp-up phase of ESCI

ESCI arose from the abundance of strategic funding in the second year of the newly established Aalto University in 2011. Adopting an increasingly managerialistic orientation, Aalto urged its schools to identify and focus on selected research areas in the pursuit of international excellence. It funded the schools efforts with a dedicated strategic funding, from which SCI allocated a major part to five 'spearhead' programs, strategic initiatives. ESCI was one the five initiatives, which began their operation in the beginning of 2012. With the promise of extensive funding for the coming three to five years, ESCI was encouraged to seek for long-term high-impact results with new, multidisciplinary research projects, which were not required to have previous research background or pre-results. The good financial situation supported and allowed an atmosphere in SCI that emphasized trust on people over the trust on proof of success.

The high expectations towards ESCI were high among its members in 2011 and the first half of ESCI's first operation year in 2012 changed to a disappointment in the

late 2012 when SCI management decided to reduce ESCI's budget for 2013 from the originally planned 1 million to less than 300,000 €. To ESCI it was an event, which cut down its ambitious plans of expanding to international energy research cluster right after the first operation year.

Reasons for the budget cutback

The study found four main influence factors for the sudden budget cut: impaired financial situation in Aalto; ESCI's slow progress in the first year; inferior organizational position compared to the other initiatives; and inadequate communication between the dean and ESCI management. Further interpreting the second influence factor, the empirical findings suggested that ESCI's slow progress primarily resulted from two reasons, including ambiguity challenges and too wide operation scope allowed by the poor management.

On the background of the budget cut affected the impaired financial situation of the university, which primarily affected Aalto management decision to generally decrease funding for the schools' strategic programs and change its funding structure to give more support to larger Aalto wide strategic programs. To SCI's management, in essence to the dean, the decreased funding obliged it to reduce overlap with other Aalto programs by the means of increasing efficiency.

In the face of the impaired financial situation, the dean was evaluating SCI's initiatives based on their performance in the firsts operation year. The evaluation revealed ESCI's slowness of its progress, and despite ESCI's members were confident about proof of ESCI research's potential, the outcomes of the first year were inadequate for the dean. ESCI's budget faced the largest proportional budget cuts of the SCI's initiatives. As mentioned, the empirical data indicated that two main internal aspects effected to the slow progress of ESCI during the first year. First of all, according to the ESCI members, the planning process of some of the projects took considerably longer than expected. It was mainly due to the ambiguity that the new multidisciplinary collaborations created. Secondly, some ESCI members implied that ESCI's scope was too ambitious, and the management of ESCI too slow to react on the slowness of some of the projects by reallocating funds to the most progressive ones. As a result, the dean evaluated ESCI's progress too slow to be extensively funded in the difficult financial situation.

In addition to showing slow progress in the dean's eyes, the empirical data indicates ESCI having an inferior organizational position compared with SCI's other strategic initiatives. From the three of SCI's mainly research oriented initiatives, ASCI was the most familiar to the dean of that time as he had being the initiator and the leader of it. ABC was already well established in the initiatives first years as it was a continuation of former aivoAALTO –program. The two other initiatives were solely education oriented, had narrower scale of activates and thus less ambiguity than ESCI, which initially aimed, maybe too ambitiously, to operate on all of SCI's four strategic areas: research, education, societal impact and art. As a distinction to the other initiatives, ESCI was the only strategic program that focused on area that was studied in other programs in Aalto as well. If not as a competitor, ESCI's multidisciplinary energy research could be seen at least comparable with the Aalto wide energy efficiency research program, AEF. To SCI's management ESCI's considerably smaller resources were seen as an obstacle to creating as large impact as the large AEF program, which gave another reason for the dean to find ESCI as inefficient.

The fourth factor influencing ESCI' budget cut was, according to the findings, the inadequate communication, between the ESCI initiative and the SCI management. It resulted in unilateral information about the ESCI's progress and value to the school that was mostly based on the use of ESCI's funds. As the dean changed during the first year of operation, the established communication practices between the first dean and the initiatives broke down. With new dean's management practices, the communication was left in the responsibility of the initiative management. In ESCI, due to not hiring any assistant or other administrator, none of ESCI's management board members took care of the internal marketing task, which was particularly important as the new dean had no personal commitment to ESCI. In ESCI the funds were rather allocated to the activities than to administration.

Adaptation strategies: reorienteering scope and changing conditions

Despite ESCI proposed an increase to its budget for the third orations year, the budget for 2014 remained the same as was in 2013. The study found that ESCI's decreased budget in two consequence years lead to two different adaptation strategies, and in essence, one leading to another. On the ESCI's operational level, its

research activities were pruned back to meet the reduced budget, which eventually affect the SCI management level's strategy to reorienteer ESCI's scare recourses rather to students and education than energy research.

With a reduced budget for 2013, the first adaptation strategy was implemented in the ESCI's research projects with a growing chasm between the two main research platforms. On the one side was the Green ICT platform, which did not hire graduated researchers to work in its research programs, but rather continued its explorative research approach mainly with Master's thesis projects in wide scope of research areas. Hence, it coped with the reduced budget by keeping the planned broad scope but conducted only small-scale master's thesis projects. On the other side, research in the Materials research platform chose to focus on few narrow but specific research areas with the goal of high academic impact. To this end, the projects in the platform hired postdoctoral researchers to conduct the research, rather than conducting several projects with Masters thesis workers.

The split in ESCI's research approach was partly responsible for the SCI management's pursuit to refocus ESCI's orientation, which happened between the end of 2013 and beginning of 2014. The third dean of SCI, who was appointed to his position in 2013, expressed clearly his view on ESCI's research as something to fund from external sources or by for example AEF program. To the more specified research projects in ESCI would have been more suitable for applying funding from these resources, as some of them also did, but ESCI's members agreed that the exploratory research approach that mainly was implemented in the Green ICT platform could not compete from the external funding which required tightly defined research scopes already in the beginning of the project.

The difference between these two groups was further highlighted by their differing perception on the ESCI outcomes. The members of Green ICT platform emphasized the encouraging and numerous results of their multidisciplinary research projects as well as the unique opportunity to collaborate with researchers from other disciplines. The members of the Materials platform on the other hand, considered ESCI's results as relatively insignificant due to their lack of scientific depth. To them the existence of ESCI became less relevant, after its funding was critically decreased. Nevertheless, also they recognized the value of working in collaboration with

researchers from various disciplines and broadening the general understanding of energy research in SCI.

As it became clear to ESCI's members SCI will not continue supporting ESCI's research actives after 2014, the leader of ESCI convinced the dean about the value that ESCI could bring to SCI through students working in Energy Garage. Both agreed that ESCI's small budget would be potentially more valuable in student driven activates than in small-scale research projects. Eventually the dean made a decision to grant Energy Garage schools financial support for five years onwards and on the other hand bring ESCI's research activities to an end.

Findings on Energy Garage's build up

By analyzing the empirical date, the study found two main factors that guided ESCI to establishing Energy Garage. Firstly, the planning of Energy Garage was already in the beginning of ESCI's operation carried onwards by active individuals in ESCI's management board. Despite low financial allocations to the project and that merely those active individuals were part of working with it, it steadily advanced during the whole ESCI's operation time. Most importantly, ESCI leader's personal interest towards the Energy Garage kind of activities brought Energy Garage into discussion between him and the dean of SCI, when ESCI's activities were threatened to be run down completely. The interpretation that for the ESCI leader and for few other members, Energy Garage was a way to 'keep ESCI alive', was supported by the finding that many of the ESCI's members did not reconsidered as Energy Garage meaningful to them. To the contrary, they described its emergence to be quite surprising. On the other hand, other members, including the leader of ESCI, as well as the deans of SCI considered ESCI's orientation shift from research to students and education as the best possible outcome with ESCI's small resources.

Secondly, on the background affected a trend in Aalto University to establish 'factories', 'garages' and other low-threshold innovation spaces for student driven activities. In the interviews, the members of ESCI who were part of establishing Energy Garage did not mention the corner stone of trend, the Design Factory, as a model for Energy Garage, but the third dean of SCI remarked that Energy Garage would be and opportunity to establish SCI's own 'design factory'. Looking the trend from the dean's ESCI adaptation perspective, it seemed to provide a 'perfect reasons'

for justifying ESCI's reorientation to and existence as Energy Garage. Although Energy Garage was by principle open for everyone, in practice, when Design Factory was identified as a space of the School of Engineering, Energy Garage was a project of the School of Science.

4.1.1 Further interpretation of the findings and literature reflection

The interpretation of the findings and reflecting them on the examined literature of the study sought to extend the findings into deeper insights and theoretical conclusions, as well contribute to the academic literature.

The European wide new public management reform in universities towards management practices borrowed from private companies, which this study earlier presented in the Motivation for the study –subsection, was in background on Aalto University establishment. Merger of the three universities and thus centralization of management was the first step in this managerialistic reform. As also Blaschke et al. (2014) noted about adaptation of managerialism in universities, the change towards managerialistic values of regulation, efficiency and centralization in Aalto did not happen in Aalto. In the beginning, although Aalto urged its schools to seek for efficacy by focusing on specific areas of research, the schools had a freedom to emphasize these focus areas. In SCI, ESCI and other initiatives followed the strategy of the school but remained largely autonomous on their operation principles and the content and scope of their activities, apart from the dean deciding on which kind of initiatives got funding in the first place. The non-intervening management policy that prevailed in ESCI was also influenced by the good financial situation that prevailed in Aalto. Interdisciplinary, more risky initiatives such as ESCI could be established based on trust in competent people rather than promise of fast results. On this basis, ESCI as well as the other initiatives were given the freedom to develop their distinctive path, at least partially supported by the prosperous time (cf. Kotter, 2001).

Aalto made further changes to its funding model in 2012 at the same time as ESCI' budget was cut. By redirecting the university's joint units' funding flow through the schools' budgets, Aalto management increased its managerial influence and centralization of its operations. It had at least an indirect impact on the SCI dean's budget allocation decisions, since one of the SCI dean's arguments for ESCI's

budget cut was SCI's overlapping funding of two energy research oriented initiatives, ESCI and Aalto wide AEF.

Ryan and Neumann (2013) discussed the importance of three features that successful interdisciplinary research posses: the academics have a clear, common focus; the academic setting provides opportunities for appropriate communication; and the academics share a feeling ownership and commitment. The empirical findings indicated that in the beginning ESCI's members were very committed to the common task of establishing and building up the initiative. Their commitment stemmed partly by the promise of considerable funding but partly also by the excitement creating something novel. Then again, the findings also suggest that ESCI's allowing atmosphere widened the scope of its research projects so that a common 'ESCI identity' did not emerge to bind its members and projects together, but rather separated in four distinctively different groups. At least in some of the groups, the group members did however strongly identified them selves as part of their own groups, further dividing the identity gap between the ESCI members. To many of these members, commitment to the own research was therefor considerably greater than commitment to contribute to the common goals of ESCI.

Part of the problem was also ESCI's internal communication from which, especially in the later phase, a great deal was reporting about the activities of the subgroups to each other rather than elaborating them together in meetings among the subgroup representatives. As the findings indicated, after the establishment phase of ESCI, the development of these subgroups happened mostly, with few exceptions, within the subgroups without all without collaboration with the other subgroup members. It could even be said that the subgroups formed their own disciplines, but ESCI did not establish enough collaboration between these disciplines to be called interdisciplinary in the definition of the term, as Ryan and Neumann (2013) defined it.

Likewise the lack of wide scope of ESCI's operation created difficulties in ESCI's internal communication, the managerial control approach in SCI did not encourage to adequate communication between ESCI and the SCI management either. Although the study did not fully confirm, nor did it intend to confirm, Middlehurst's and Elton's (1992) and Ryan's and Neumann's (2013) suggestions about the relation

between control and top down management in managerialistic academic institutions and the decrease in frank communication between the management and the academics, the empirical findings clearly indicated a lack of proper commutation between the dean and ESCI management. It appeared in its most clearest in the change of the deans. When the first dean of SCI left his position in the middle of the initiatives' first operation year, the established communication practices were also largely dissolved. They were built on the personal relationships between the dean and ESCI leader, and not part of the routines between a dean and initiative management that would pass on despite the personnel changes.

In ESCI's case, even unofficial communication was not proactively upheld, and thus, when dean evaluated SCI's initiatives performance, ESCI appear mostly in the light of it not-so-flattering quantitative information: objectives reached and money spent.

The findings suggest that ESCI's budget cut was the first step towards its orientation shift. With its small budget, the added value that ESCI brought in the whole Aalto context was seen as insignificant compared with the large Aalto wide energy initiative AEF. Especially, when some of ESCI professors' researches were already funded by the AEF, the second and the third dean of SCI did not have many arguments to justify the coexistence of two energy initiatives in Aalto.

As Santiago et al. (2006) show, if academic managers are faced with a significant budget cut, they are apt to cut down running costs, and try to avoid staff lay offs of as long as possible. The same went with ESCI's case, and it was even threatened to be left completely without funding until the dean gave his decision to continue funding ESCI's research activates until the end of its third operation year from which onwards support ESCI's Energy Garage project. The empirical findings supports a conclusion that from the SCI and Aalto's management's point of view, funding Energy Garage was a good decision from two reasons: First, ending ESCI's research and encouraging the projects to apply their funding from AEF and from external funding sources would go well along with the university's pursuit to seek for higher research impact from large joint programs and emphasizing external funding sources in its research funding policy. Second, for SCI, ESCI's orientation sift would open an opportunity to leverage for its research, education and corporate relations through a student activity with a concept that had an earlier proof from the School of

Engineering's Design Factory and significant support from Aalto's management. In addition, supporting Energy Garage operation was considerably less expensive than funding ESCI's research activities, and therefore it was also less risky as subject of the strategic funding.

As these findings and conclusion show, the dean and Aalto's general strategic development had a significant role in the course of ESCI's development path.

The bottom-up operation in Energy Garage project showed extraordinary commitment and excitement towards the project, from the students to the dean. While it helped to successfully establish the Energy Garage space, it also stood as contrast to the decreased commitment and motivation in some of ESCI's members after ESCI's ambitious plans could not be realized in the tight financial situation. As the findings indicate, the researchers in ESCI whose research was more specific and oriented towards certain goals from the beginning on, were also the most influenced by the cut of the budget. On the other hand, the more vague, explanatory and interdisciplinary projects adapted better to the dramatic budget cut and delivered results, which their participants considered to be greatly promising.

Even though, some academic articles (Smeenk et al., 2009; Blaschke et al, 2014) suggest that university units will eventually modify and adopt the new public management approach to their fashion (Smeenk et al., 2009), in ESCI's case, while Green ICT was experienced by the professors as success, it only yielded academically light-weight reports. Materials, on the other hand, produced a few academic papers, despite the professors experiencing it as failure.

4.2 Suggestion for strategic initiative management

The second research question asked: *How should universities organize and manage strategic research initiatives?* The normative interpretation of the findings suggested four

1. *Find operational focus*
2. *Commit and create commitment*
3. *Form effective communication practices*
4. *Foster local initiatives*

Addressing the second research question the study sought for managerial application. The suggestions are intended for future academic top-level managers such as deans of university schools, who manage strategic initiatives in a managerialistic environment, as well as for mangers of these initiatives.

Find operational focus

As this study showed a wide scoped operation of a strategic initiative will encounter difficulties with the managerialistic higher management in the university. The finding was also supported the literature (Meister-Scheytt & Scheytt, 2005; Ryan & Neumann, 2013) which suggested a common focus, especially within an interdisciplinary research unit, is a key success factor. Goal setting and enabling but also directing approach to manage the initiative's operation, content and scope are crucial actions in the establishment phase of a strategic initiative. In ESCI's case, the allowing atmosphere invited researchers from variety of different disciplines to collaborate in novel way in the framework of SCI. It generated results, which would not have happened without the interdisciplinary collaboration, but at the same time created a distinctive difference in the research approach between the teams. The distinction enhanced ESCI's image in a light of ambiguity and slow progress. To avoid this and to create a clear and easily communicable direction, this study suggests to rather focus on one larger topic than disperse the scope in to several directions. The initiative management should also emphasize joint efforts to early on identify common larger objectives and a strategic path towards it.

Form effective communication practices

Looking strategic initiatives form the owner's, for example the school's, perspective, this study suggests to establish management and communication practices between the owner and the initiative, in ESCI's case between the School of Science management and the ESCI management, that are disconnected from the personal dependencies. In practice, it could be a written agreement about how often, between whom and how the initiative reports and communicates between it and the owner. The agreement should also define the measures, qualitative or quantitative, that the initiative is evaluated by the owner. Also, the evaluation should take in consideration the possible ambiguous nature of initiative, and thus focus on the potential of making

an impact, where by communication of qualitative measures plays an emphasized role.

As the subject case showed, from the beginning on ESCI management and the second and the third deans had distinctively different belief about the certainty and the duration of school's financial support. ESCI's management board members were in the belief that the school would fund the initiative in 3+2 years principle from which the last four years would be with funding of 1 million €, when in practice, the dean negotiated SCI's own strategic budget from Aalto management on annual basis and based the strategic initiatives' funding decisions on the granted strategic budget. Also the disconnection of the established communication practices in the change of the SCI dean had a negative effect on ESCI's support from the school. The frank and regular communication would also help to sustain a trustful relationship and decrease the gap between the management and operational levels of the initiate and the school management (Ryan & Neumann, 2013).

Commit and create commitment

The findings from the study suggest that, in ESCI's case, the commitment of its members was most affected by how meaningful they perceived their work. The subgroups members who saw that the value of their work was more depended on the amount of funding, were also less committed to ESCI and less satisfied for the outcomes of their work. Then again, for example the ESCI members who participated in the Energy Garage project described the commitment in the project group to be extraordinary high, which eventually resulted in outcome that were widely held as success. The difference between these projects were that the former lost their support from the schools management and the latter was granted with promise of long term financial support from the school along the dean's personal commitment. The higher-level management's support and trust to Energy Garage project gave a freedom to the project members to create content with bottom-up approach and thus enchased their attachment and commitment to their work.

These empirical findings were also supported in the literature. For example the studies of Teelken (2012) and Middlehurst and Elton (1992) suggest that top-down decisions, centralization and managerialistic approach to seek for short-term success tend to result in loss of commitment and trust to institutions. Thereafter, this study

suggests that higher-level management's long-term commitment and trust the strategic initiatives bottom-up work are important in creating a commitment and motivation that potentially leads to better outcomes.

Foster local initiatives

For the ESCI members, ESCI's greatest value over other energy research initiatives such as AEF was the academic freedom and truly science-based research without obligations to adjust the research focus after the top-level management orders or funding sources criteria. From this point of view, ESCI appeared as a counter force to the prevailing managerialism trend in university management approach that emphasizes centralized management and greater unit sizes in the name of increased economical efficiency. The late literature of the subject have raised concerns about negative effects of the centralization of research, including homogenization of research results (Wedlin, 2007; Geuna & Martin, 2003) or further disciplination of research through lack of the feeling of ownership (Ryan & Neumann, 2013).

As noted in the third managerial suggestion above, valuing bottom-up approach in initiative management indicated to result in positive outcome, not achievable by control of the higher organizational levels. Further on, the empirical findings also suggested that for example the bottom-up approach that prevailed in most of ESCI's operations, could not have being sustained in greater, centralized university programs such as AEF. Thus, this study suggests to prevail and foster the local, school or department specific initiatives.

4.3 Limitations and future research

The chosen data analysis method relays on abductive reasoning in the interpretation of the findings, thus the conclusions were drawn by combining the inductive reasoning of the qualitative empirical data and the deductive reasoning of the iterative literature review. The subjectivity in the researcher's interpretation of the qualitative data was acknowledged, as well as the subjectivity in the iterative process of selecting the literature framework against the findings was reflected. The same went with the data sampling, with the exception that the interviews were chosen based on the whole research group's common research objectives and ever developing hypothesis. The hypothesis of the research case developed during the

research process in discussions with the research team and in the intermediate analysis of the data. All in all 23 informants were interviewed for this study, but it is noticeable that in the final interpretation only 16 of them was employed due to a change in research focus and hypothesis. However, it should be noted that these seven 'surplus' interviews also played a very important role in the overall development and their value to this research should not be underestimated. In retrospective, one could argue that a more comprehensive data gathering by interviewing other actors in the case context would have a more accurate overview of course and reflections of the events related to the case subject. Nevertheless, for the context of a Master's Thesis the quantity and scope of the data can be considered sufficient.

Other limitations concerns mainly the second research question of the study: How should universities organize and manage strategic research initiatives?. First of all, the scope of the question is much too wide in order to be addressed precisely and thus no explicit answer could be given. The four suggestions that this study gave represent merely a narrow aspect of the broad issue. Thus the suggestions should be seen as recommendations that are general by but at the same time drawn only from a single case study analysis. Furthermore, as the study sought an answer to research question about the management of a successful initiative, this study's contributions to the question have to be limited to the learnings from an unsuccessful initiative. In essence, it means that by observing difficulties, conflicting interests and other negative features of the subjects, the study draws its conclusions and suggestion from learnings from failures. Also, one should be careful drawing generalizations from a single case study such as this. The academic environment, organizational structure, management practices and even personal differences affect the operation of any university organization, not least a strategic initiative. Thus, the setting from which this studies learnings are drawn may not prevail in other strategic initiatives, implying that the suggestions should be applied carefully.

Since the case study subject represented the unsuccessful strategic initiatives, future research should conduct a comparative study of one of the more successful strategic initiative in the same organizational context, in the School of Science. Also, the future study could try to investigate if the findings can be generalized beyond the

studied case. In addition, since this laid the groundwork for further study of the same case, it created only a general overview of the events, people and their casual relationships to the outcomes. The future research could examine further a more specifically for example the role of the initiative's leader's management practices in the initiative's quick adaptation to unfavorable financial situation. This study found that he had the key part deciding about the initiative's direction, but a closer look at the role of personal ambitions and feeling of ownerships could yield more relevant findings about the role of individual leaders in academic research management.

Further addressing the first research question about the development process of the study subject, it would be also interesting to examine the significance of the interdisciplinarity in the study case. The study found that the case subject implemented an interdisciplinary approach in its operation, and suggested that it was one the factors causing operational difficulties but at the same time enabled outcomes not possible to achieve without the collaboration of disciplines. But, what is the cost-benefit balance of interdisciplinarity in academic research projects, how does interdisciplinarity fit in with the new public management approach or does interdisciplinarity fit certain research areas better than others? These questions should be answered in a follow-up study with a narrower scope, and if possible address the issue in from more generalizing aspect to form prescriptive managerial recommendations.

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6 Appendix

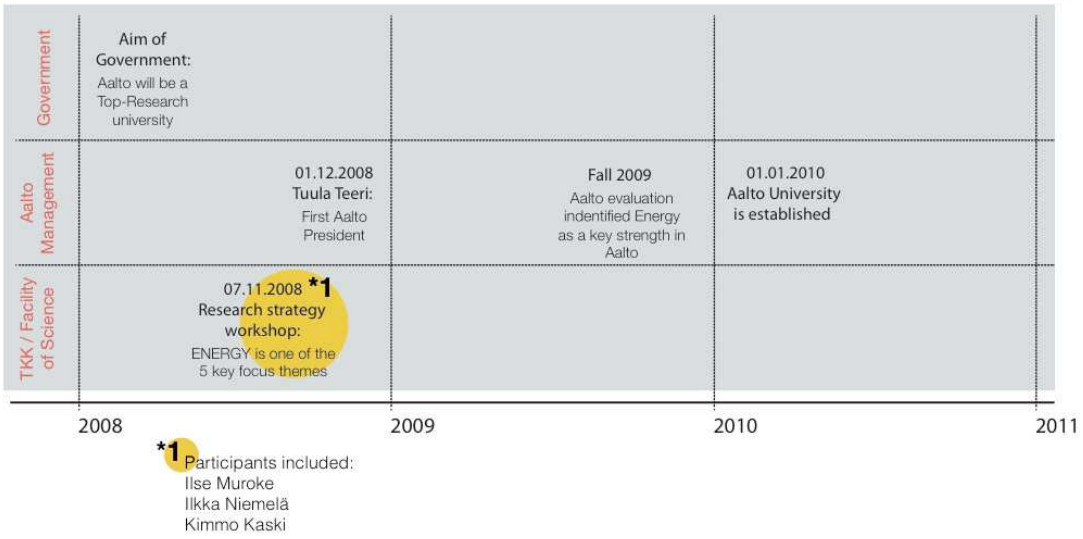
Interviewees

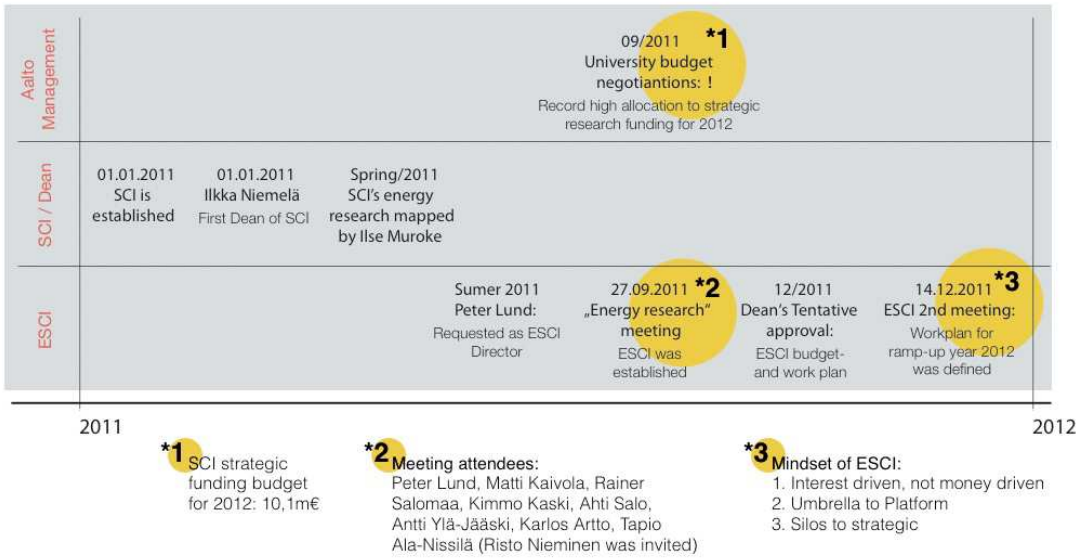
Name	Position	Organization	Role	Duration (min)	Date
Ilse Muroke	Development Manager (2010-13)	SCI	Was initiating ESCI along with Dean Ilkka Niemelä.	89	23.02.2015
Risto Nieminen	Dean of SCI (2013-)	SCI, PHYSICS	Decided from the ending of research operation of ESCI and the opening of Energy Garage. Member of AEF Management team (2012-2013).	75	20.03.2015
Peter Lund	Professor of Advanced Energy Systems, Director of ESCI (2011-2014)	PHYSICS, ESCI	Initiator in establishing and the Chair of ESCI	124	14.11.2014
Antti Ylä-Jääski	Professor Of Data Communications Software	CSE	Part of ESCI Executive Committee. Head of Green ICT research platform and director of electric car research with Jukka Nurminen.	76	23.02.2015
Kimmo Kaski	Dean of SCI (2012-2013), Head of AScI Executive Committee (2012-)	SCI, CSE, ASCI	Active leader of AScI. Part of ESCI board a short period in 2012. The dean of SCI 2012-2013	75	20.03.2015
Karlos Artto	Professor of Project-Oriented Business, ESCI board member	DIEM, ESCI	Member of ESCI Executive Committee and later on member of Energy Garage management team. Activator of ESCI group, pleading ESCI's agenda onwards. Director of a Master's thesis on Electric Car territories.	106	21.11.2014
Tapio Ala-Nissilä	Professor of Physics, ESCI board member, ESCI board member	PHYSICS, ESCI	Member of ESCI Executive Committee. Conducted research in Materials platform as we ll as in Nanoplasmonics. Active role in ESCI board meetings.	73	23.02.2015
Ilkka Niemelä	Aalto university Provost (2014-), Vice President (12-14), Dean of SCI (11-12)	AALTO, SCI, ICS	Attended the SCI meeting where Energy was chosen to be one of SCI's key focus areas. With Ilse Muroke chose Peter Lund to lead ESCI. Approved ESCI's operation plan written in 2011.	55	01.04.2015
Inkeri Ruuska	Development Manager (2013-2015)	SCI	As the Development Manager, the communication link between ESCI the dean. Actively took part in Energy Garage development.	89	26.11.2015
Filip Tuomisto	Professor of Nuclear Engineering, ESCI board member	PHYSICS, ESCI	Member of ESCI Executive Committee. Lead researcher in Materials research platform.	73	11.02.2015
Lily Diaz-Kommonen	Professor of Systems of representation and digital cultural heritage	MEDIA	Part of conducting experimental and multidisciplinary research in Green ICT research platform. Lecturer in the "Multi-disciplinary energy perspectives" course from Arts School .	60	04.02.2015
Tuomas Autero	Student	DF	Leading role in the student team designing Energy Garage concept in MIND's course "Innovation in Action".	98	10.02.2015
Teemu Havisalo	Student	DF	Leading role in the student team designing Energy Garage concept in MIND's course "Innovation in Action".	57	06.06.2015
Kendrick Bingham	Technology manager	SCI	Obtained the permit to use K4 space for Energy Garage.	60	01.12.2014
Tarmo Havunta	Campus Designer/Manager	Campus Services	Manager of the building and engineering the Energy Garage renovations.	83	10.12.2014

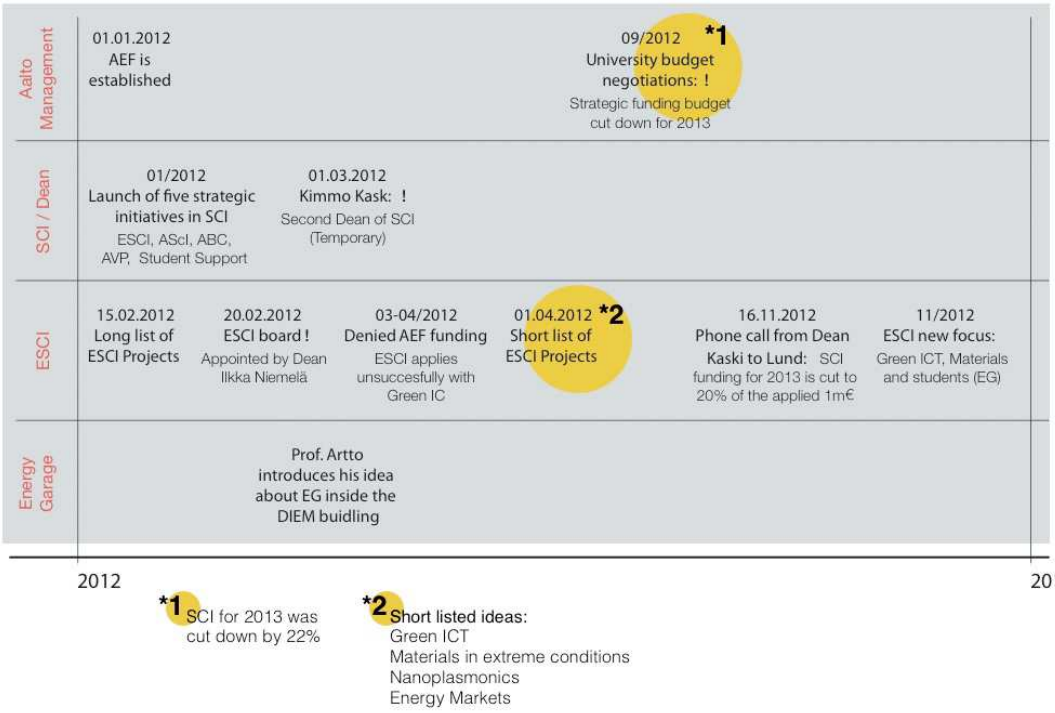
Mikko Virta	Student Project Manager	EG	Manager of the Energy Garage in the planning, building and operation phases of Energy Garage. Led the planning meetings and kept Energy Garage operating in a practical level.	85	14.11.2014
Valeria Gryada	Interior Designer	Aalto Libraries	Made interior design plans for Energy Garage and participated in the planning meetings.	70	03.12.2014
Markus Junkkari	Chairman, student	Prodeko	Participated the planning meetings of Energy Garage. Have being supervising Energy Garage space during its open hours.	50	18.12.2014
Eetu Ahonen	Chairman, student (2014)	Fyysikkokilta	Participated the planning meetings of Energy Garage. Have being supervising Energy Garage space during its open hours.	55	27.02.2015
Esa-Mikko Santamäki	Chief of spatial design	ADF	Member in the team designing a Factory 2.0 to the same area with Energy Garage. Introduced their design plans on K4 space to Energy Garage planning team.	83	23.02.2015
Petri Kuosmanen	Head of Department	MECHENG	Runs an event called Mechatronic Circus which was one of the inspirations for Energy Garage. Had discussions with Peter Lund and Mikko Virta about cooperation between Mechatronics department and Energy Garage.	89	04.02.2015
Pirjo Peippo-Lavikka	Dean's executive assistant	SCI	0	120	20.05.2015
Ilkka Leppänen	Controller	SCI	0	10	01.06.2015

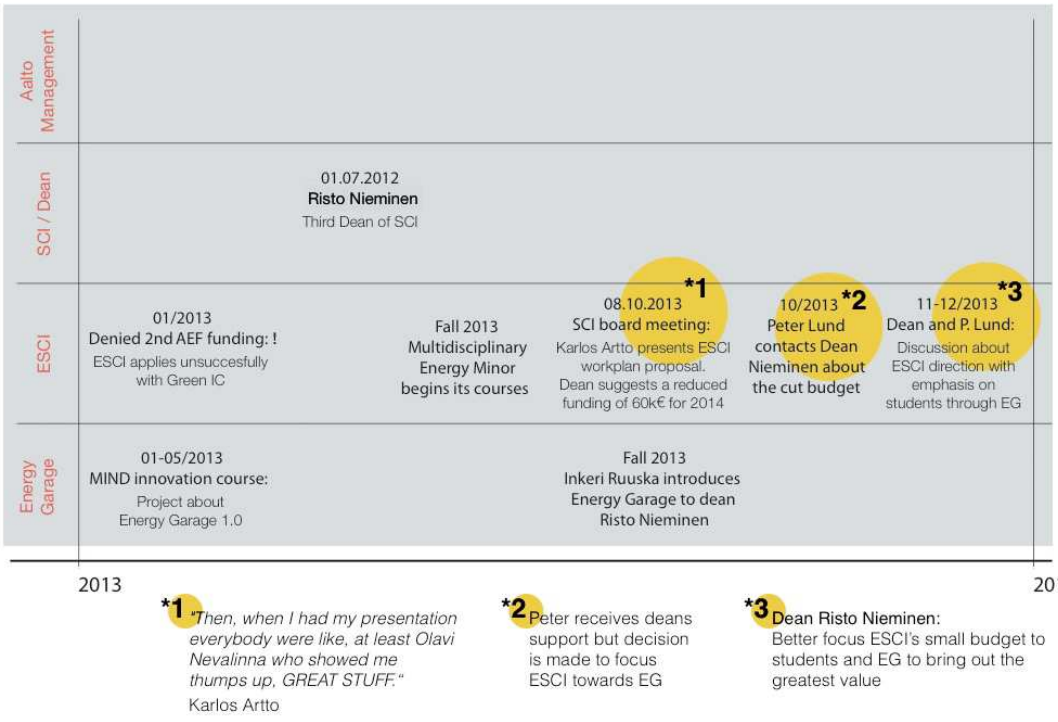
Table 8 Interview informants with organizational position, represented organization, role in ESCI story, interview duration and date

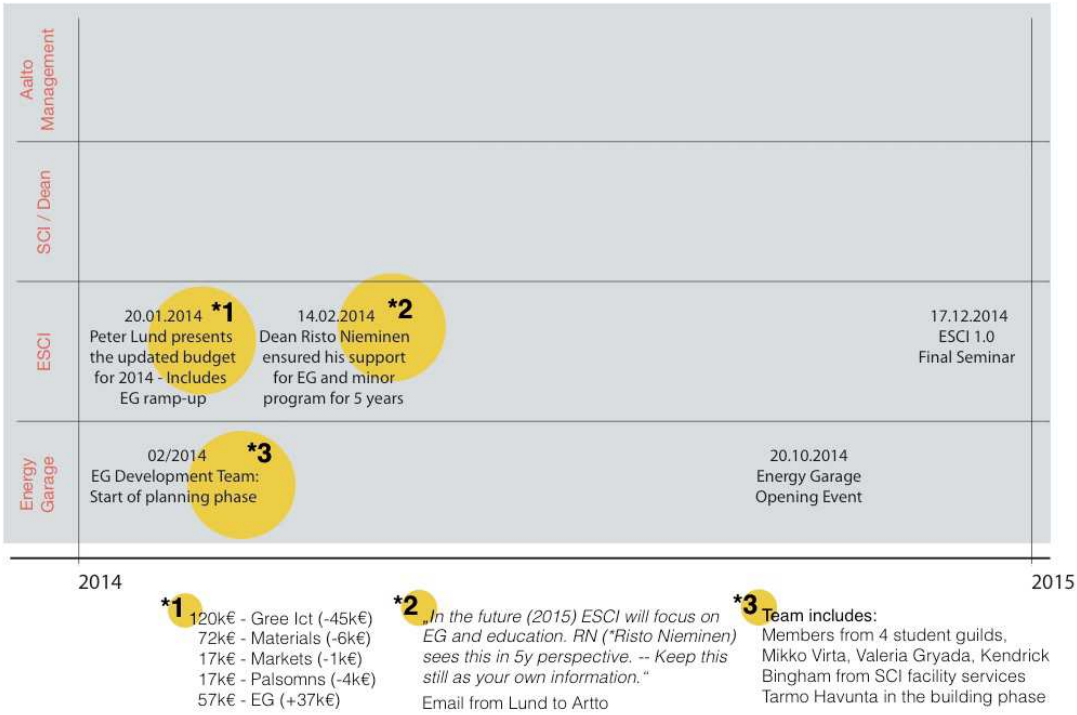
Timeline


Government
Aalto Management
TKK / Facility of Science
Aim of Government:
Aalto will be a Top-Research university
01.12.2008
Tuula Teeri:
First Aalto President
Fall 2009
Aalto evaluation indentified Energy as a key strength in Aalto
01.01.2010
Aalto University is established
07.11.2008 *1
Research strategy workshop:
ENERGY is one of the 5 key focus themes
2008
2009
2010
2011
*1 Participants included:
Ilse Muroke
Ilkka Niemelä
Kimmo Kaski


Aalto Management
SCI / Dean
ESCI
09/2011 *1
University budget negotiantions: !
Record high allocation to strategic research funding for 2012
01.01.2011
SCI is established
01.01.2011
Ilkka Niemelä
First Dean of SCI
Spring/2011
SCI's energy research mapped by Ilse Muroke
Sumer 2011
Peter Lund:
Requested as ESCI Director
27.09.2011 *2
„Energy research" meeting
ESCI was established
12/2011
Dean's Tentative approval:
ESCI budget- and work plan
14.12.2011 *3
ESCI 2nd meeting:
Workplan for ramp-up year 2012 was defined
2011
2012
*1 SCI strategic funding budget for 2012: 10,1m€
*2 Meeting attendees:
Peter Lund, Matti Kaivola, Rainer Salomaa, Kimmo Kaski, Ahti Salo, Antti Ylä-Jääski, Karlos Artto, Tapio Ala-Nissilä (Risto Nieminen was invited)
*3 Mindset of ESCI:
1. Interest driven, not money driven
2. Umbrella to Platform
3. Silos to strategic


Aalto Management
SCI / Dean
ESCI
Energy Garage
01.01.2012
AEF is established
09/2012 *1
University budget negotiations: !
Strategic funding budget cut down for 2013
01/2012
Launch of five strategic initiatives in SCI
ESCI, AScI, ABC, AVP, Student Support
01.03.2012
Kimmo Kask: !
Second Dean of SCI (Temporary)
15.02.2012
Long list of ESCI Projects
20.02.2012
ESCI board !
Appointed by Dean Ilkka Niemelä
03-04/2012
Denied AEF funding
ESCI applies unsuccesfully with Green IC
01.04.2012 *2
Short list of ESCI Projects
16.11.2012
Phone call from Dean Kaski to Lund: SCI funding for 2013 is cut to 20% of the applied 1m€
11/2012
ESCI new focus:
Green ICT, Materials and students (EG)
Prof. Artto introduces his idea about EG inside the DIEM buidling
2012
2013
*1 SCI for 2013 was cut down by 22%
*2 Short listed ideas:
Green ICT
Materials in extreme conditions
Nanoplasmonics
Energy Markets


Aalto Management
SCI / Dean
ESCI
Energy Garage
01.07.2012
Risto Nieminen
Third Dean of SCI
01/2013
Denied 2nd AEF funding: !
ESCI applies unsuccesfully with Green IC
Fall 2013
Multidisciplinary Energy Minor begins its courses
08.10.2013 *1
SCI board meeting:
Karlos Artto presents ESCI workplan proposal. Dean suggests a reduced funding of 60k€ for 2014
10/2013 *2
Peter Lund contacts Dean Nieminen about the cut budget
11-12/2013 *3
Dean and P. Lund:
Discussion about ESCI direction with emphasis on students through EG
01-05/2013
MIND innovation course:
Project about Energy Garage 1.0
Fall 2013
Inkeri Ruuska introduces Energy Garage to dean Risto Nieminen
2013
2014
*1 "Then, when I had my presentation everybody were like, at least Olavi Nevalinna who showed me thumps up, GREAT STUFF."
Karlos Artto
*2 Peter receives deans support but decision is made to focus ESCI towards EG
*3 Dean Risto Nieminen:
Better focus ESCI's small budget to students and EG to bring out the greatest value


Aalto Management
SCI / Dean
ESCI
Energy Garage
20.01.2014 *1
Peter Lund presents the updated budget for 2014 - Includes EG ramp-up
14.02.2014 *2
Dean Risto Nieminen ensured his support for EG and minor program for 5 years
17.12.2014
ESCI 1.0
Final Seminar
02/2014 *3
EG Development Team:
Start of planning phase
20.10.2014
Energy Garage
Opening Event
2014
2015
*1 120k€ - Gree Ict (-45k€)
72k€ - Materials (-6k€)
17k€ - Markets (-1k€)
17k€ - Palsomns (-4k€)
57k€ - EG (+37k€)
*2 „In the future (2015) ESCI will focus on EG and education. RN (*Risto Nieminen) sees this in 5y perspective. -- Keep this still as your own information."
Email from Lund to Artto
*3 Team includes:
Members from 4 student guilds,
Mikko Virta, Valeria Gryada, Kendrick Bingham from SCI facility services
Tarmo Havunta in the building phase